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COLLECTIVE REVIEW

VASCULAR MALFORMATIONS AND VASCULAR TUMORS OF THE GASTROINTESTINAL TRACT

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VASCULAR malformations and vascular tumors are rarely encountered in the gastrointestinal tract and no single investigator has had the opportunity to study more than a few cases. The relatively high incidence of serious clinical complications and malignant disease associated with these lesions was appreciated only after an extensive review of the literature and analysis of available histopathologic material. A comprehensive analysis of various methods of treatment and prognosis has been undertaken to assist further in securing satisfactory answers to the remaining unsolved problems.

MATERIALS AND METHODS OF STUDY

Vascular lesions involving the gastrointestinal tract have been reported since 1839; however, their infrequent occurrence made it seem desirable to summarize every case report encountered in the available literature and thus to secure basic data for statistical analysis and for formulation of accurate conclusions. Table I gives a brief classification of all cases by type of lesion, by source, and by certain other characteristics. Table II summarizes the case reports appearing in the literature from 1839 to 1945, inclusive.

Abridgment of portion of thesis submitted by Dr. Gentry to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Surgery.

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The material utilized in this review included also the case records from the Mayo Clinic files through June, 1945, wherein a diagnosis had been made of either a vascular malformation or a vascular tumor of the gastrointestinal tract. Records of 106 vascular lesions were found in a review of approximately 1,400,000 case records. This group included 46 patients with vascular lesions observed at the time of surgical treatment, whereas, during a further study of more than 10,000 records of autopsies which were performed in the 20 year period from 1925 through 1944, 60 more vascular tumors or vascular malformations of the gastrointestinal tract were found. No esophageal varices were included in this study.

Both the surgical and autopsy specimens were examined and classified according to their histopathologic structure and their location in the gastrointestinal tract.

A clinical review and analysis of these 106 cases constitute the basis for the second part of this study, summarized in Table III.

PATHOLOGY

The description of the pathologic processes which are classified under the heading of vascular malformations and vascular tumors presents unusual difficulties. Vascular abnormalities may display either pronounced neoplastic properties of their own or subordinate themselves to complicated histopathologic changes which occur in various associated organs and tissues. The scope of

this review will be limited primarily to a classification and clinicopathologic descriptions of those vascular lesions which involve the gastrointestinal tract; however, a brief general discussion of histogenesis is presented with each group in order to assist with a more accurate and comprehensive classification of these lesions.

CLASSIFICATION

One of the most useful methods of classification of tumors is based on histogenesis; however, a consideration of the histology and architecture of vascular lesions has been valuable in determining prognosis and methods of treatment.

Brown classified the hemangiomas of the intestinal tract according to their effect on the surrounding substrate and considered these lesions primarily from the standpoint of possible surgical intervention. Gross and Wolbach compared average sections in different tumors and grouped together those which matched most closely. Kaijser's classification, which has been stated to be essentially that of Oberndorfer, has many favorable attributes; however, he included, in a benign group, some vascular lesions which many pathologists consider to be malignant.

The following classification, based on histopathologic detail, tends to emphasize the value of certain forms of treatment and the resulting prognosis.

Benign vascular lesions
- A. Telangiectasis (hereditary and nonhereditary types)
- B. Hemangioma
  1. Capillary hemangioma (simplex, mostly single)
  2. Mixed capillary and cavernous hemangioma
  3. Cavernous hemangioma
     - a. Multiple phlebectasis (small cavernous)
     - b. Simple polypoid (single cavernous)
     - c. Diffuse expansive (single contiguous)
     - d. Diffuse expansive (multiple noncontiguous)

Malignant vascular lesions
- A. Hemangioendothelioma
- B. "Benign metastasizing hemangioma"
- C. Kaposi's sarcoma
- D. Angiosarcoma

BENIGN VASCULAR TUMORS

Phillips (192), in 1839, described what was perhaps the first vascular tumor of the gastrointestinal tract reported in the literature. An indoor servant in the service of a nobleman had three severe hemorrhages from straining at stool. A tumor the size of a French walnut was found in the rectum and irritation from neighboring parts made it tense and turgid. This vascular lesion had a livid, irregular fungous appearance and was attached to five-sixths of the anal margin. It was removed by needle ligature.

Syme, in 1854, and Quain, in 1855, reported 3 more cases of soft vascular rectal tumors.

Rokitansky (207), in the English translation of his manual of pathologic anatomy published in 1855, mentioned the occurrence of vascular tumors in both the stomach and intestines. Regarding the stomach he wrote:

"Erectile tissue is either developed in the free ends of polypi, or the mucous membrane degenerates into it on a large surface, upon which the erectile tumor is attached by a broad base, or only by a very short neck or stalk. It is the common seat of encephaloid infiltration."

R. H. Fitz, in 1872, reviewed a case report published by Laboulbéne in which a 64 year old man died of a single massive hemorrhage from an ulcerated cavernous hemangioma of the duodenum.

Virchow, Aeby, Thoma, Ribbert, and many others, before the turn of the nineteenth century, contributed to the basic concepts of pathogenesis and histopathology of vascular malformations and tumors.

Brown, in 1924, classified the hemangiomas of the small and large intestine into four groups and collected reports of 19 cases from the literature.

Geschickter and Keasbey reviewed the data on 570 tumors of the blood vessels listed in the surgical and autopsy records of the Johns Hopkins Hospital. The majority of these tumors were located in the subcutaneous parts of the body although the liver contained 109 of the lesions. Only 10, or less than 2 per cent, were divided between the spleen, intestines, and mesentery.

Kaijser, in 1936 and after a careful study of the world literature, collected reports of only 74 cases of vascular tumors involving the gastrointestinal tract. He emphasized the roentgenographic appearance of phleboliths in these lesions and its possible value in diagnosis before surgical exploration.

In 1941 Morton and Burger described the first hemangioma seen during gastroscopy.

Christopher, in 1942, found reports of 11 cases of vascular tumors involving the gastrointestinal tract which were cited in the literature since the comprehensive review by Kaijser.

Telangiectasis. The term "telangiectasis" is generally considered to refer to dilatation of exist-

TABLE I.—VASCULAR MALFORMATIONS AND VASCULAR TUMORS OF THE GASTROINTESTINAL TRACT: CASES BY TYPE OF LESION, BY SOURCE, AND BY SELECTED FEATURES MENTIONED

Lesion	Cases by source						Condition mentioned, cases					
	Literature excluding clinic cases		Mayo Clinic		Total		Symptoms during life	Treatment of lesion		Death from lesion	Lesion found incidentally at necropsy	Ratio of males to females
	Cases	Per cent	Cases	Per cent	Cases	Per cent		Operation	Other			
Benign, total	189	100	94	100	283	100	186	86	15	33	97	2.4:1
Telangiectasia	26	14	2	2	28	10	26	3	2	4	2	1.6:1
Capillary hemangioma	12	6	6	6	18	6	16	14	1	2	2	2.5:1
Mixed capillary and cavernous hemangioma	8	4	10	11	18	6	16	10	0	3	2	2:1
Multiple phlebectasia	40	21	54	58	94	33	17	6	0	3	77	5.8:1
Single polypoid cavernous hemangioma	36	19	14	15	50	18	40	23	1	4	10	1.6:1
Diffuse expansive cavernous hemangioma	35	19	5	5	40	14	38	8	11	11	2	0.9:1
Multiple diffuse cavernous hemangioma	14	7	2	2	16	6	15	4	2	3	1	1.4:1
Unclassified hemangioma	18	10	1	1	19	7	18	4	1	3	1	8:1
Malignant, total	45	100	16	100	61	100	61	19	10	29	0	1.1:1
Endothelioma	14	31	0	0	14	23	14	3	1	0	0	4:0
Hemangioendothelioma	8	18	14	86	22	35	22	10	5	4	0	0.9:1
Kaposi's sarcoma	14	31	1	7	15	25	15	0	2	15	0	4:0
"Benign metastasizing hemangioma"	4	9	0	0	4	7	4	2	0	4	0	0:3
Angiosarcoma	5	11	1	7	6	10	6	4	2	6	0	0.7:1

ing blood vessels, whereas "angiomatosis" refers to the formation of outgrowths of ectopic endothelium-lined blood-containing spaces. The telangiectatic lesions are capillary in structure but, microscopically, channels larger than normal are demonstrable.

As early as 1852 Rokitansky (208) observed telangiectatic lesions in the mucous membrane of the intestine.

Interest in the hereditary type of hemorrhagic telangiectasis dates from a paper published in 1901 by Osler (184), although Rendu, in 1896, was the first to associate familial epistaxis and multiple telangiectasia of the mucous membrane in the gastrointestinal tract.

Still earlier, in 1869, Wilson reported the first instance of gastrointestinal bleeding from telangiectatic lesions and called the condition "eruptive angioma." Becker, in 1926, and Magnusson, in 1934, collected the reports of cases from the literature and classified the various types of generalized and hereditary telangiectasis. Renshaw, in 1939, reported the first case in which the lesion was seen with the gastroscope, while Schuster, Fox, and Goldstein listed the reports of fatal cases involving the gastrointestinal tract.

Pathogenesis and classification. Lanceplaine, in 1904, advanced three theories for the pathogenesis of generalized telangiectasis: (1) disturbance of the vasomotor nerves, (2) embarrassment of the general circulation, and (3) toxicity.

Hanes, in 1909, and later Gjessing, in 1916, drew attention to the absence of elastic and muscular elements in the vessel walls in cases of hereditary telangiectasia.

The term "telangiectasis" was soon recognized as a relative term, for few adults have not suffered a certain degree of peripheral vascular ectasia, and it has become evident that there are many pathologic lesions which can be grouped under this heading.

A consideration of those lesions which produce gastrointestinal hemorrhage centers primarily around the hereditary hemorrhagic group which form the basis for the collected reports of cases and for the histopathologic study presented in this review.

Hereditary hemorrhagic telangiectasia. Three classical requisites are necessary to establish a diagnosis of hereditary hemorrhagic telangiectasia: (1) history of repeated hemorrhages, (2) telangiectatic lesions of the mucous membrane of the nasal or oral cavities, viscera, or skin, and (3) a familial occurrence.

Fitz-Hugh has shown that atavism unquestionably exists so that, although the disease is heredi-

tary, it may not be manifest in the immediately preceding generation.

Histopathology. It is difficult to determine by histologic examination whether there is a new formation of vessels or just a capillary dilatation of pre-existing channels. Hanes performed a biopsy in Osler's original case and noted an absence of muscular and elastic tissue in the walls of the dilated vessels. Memmesheimer, in 1928, observed poorly differentiated connective tissue elements in the vicinity of the dilated vessels. These workers considered this inherent weakness in the vessel walls and supporting connective tissue to be an important predisposing factor in the development of telangiectasia.

Incidence. The incidence of multiple hemorrhagic telangiectasia is difficult to determine because a number of the reported cases probably do not belong in this category. According to Goldstein (92), approximately 100 families, which included 600 cases, have been recorded in the available medical literature of the world.

The criteria for an absolute diagnosis of gastrointestinal telangiectasia should be limited to those based on histopathologic study; however, presumptive evidence was accepted in a limited number of cases classified in Table II.

Numerous lesions have been visualized with the aid of a gastroscope or proctoscope, while still others have been found at the time of surgical treatment or autopsy. A careful review of each patient's history is of importance to eliminate cases of factitial proctitis and secondary telangiectasia resulting from roentgen or radium therapy.

Reports of 28 cases of visceral telangiectasia were found in this review of the literature.

Symptoms and treatment. All of the patients noted the onset of gastrointestinal bleeding early in childhood and many experienced severe recurrent hemorrhages throughout life.

The treatment of surface lesions is directed toward the control of immediate hemorrhage and the general systemic effects resulting from acute and chronic blood loss. The use of radium, electrocoagulation, or chemical caustics may control the bleeding points. Telangiectasia of the rectum might be treated in a similar manner through the proctoscope.

Surgical extirpation of these lesions is impractical because of their multiplicity and their tendency toward spontaneous regression.

In 1943 Figi and Watkins mentioned the use of repeated small injections of moccasin venom to decrease the hemorrhagic tendency of these lesions, and Kushlan, in 1946, reported cessation of further bleeding after administration of rutin, a flavone glucoside. A proper evaluation of these two forms of treatment will require further controlled studies.

The prognosis for patients harboring gastrointestinal telangiectatic lesions is difficult to estimate because of the peculiar characteristics of these lesions; namely, their tendency toward spontaneous regression followed by a return of symptoms. Five of the 28 patients reported on in the literature died of hemorrhage and others were debilitated by a persistent secondary anemia.

Hemangioma. These are true neoplastic lesions involving the vascular system. It is generally believed that simple hemangiomas are congenital in nature, have their origin in embryonic sequestrations of mesodermal tissue, and enlarge by projecting buds of endothelial cells. Some may undergo rapid acceleration of growth and become locally destructive or even cause death by hemorrhage, sepsis, or mechanical obstruction. At times it is difficult to make a distinction between angiomas and angiectases.

From hemangiomas must be excluded several lesions marked by overgrowth or expansion of existing blood vessels. The hypertrophic granulation tissues and chronic varicosities serve as examples.

Histogenesis. Rokitansky (209) asserted that although hemangiomas are capable of development after birth, they are usually of congenital origin. He held that many angiomas represent simple hypertrophy of the vascular segments without neoplastic overgrowth.

Virchow, in 1863, considered intrauterine irritation of the embryonic fissures the cause of faulty cell division and formation of angiomas from pre-existing vascular elements.

Thoma, in 1896, decided that much of the growth of hemangiomas was the result of mechanical factors secondary to an increase of blood pressure and loss of support to vessel walls from changes in the surrounding tissues. These factors were thought to excite a new growth of vessels, while any increase in the rapidity of flow favored elongation and dilatation of the walls.

Ribbert, in 1896, injected the vessels leading into angiomas of the skin and liver. He found that the injected solution did not perfuse into the surrounding capillaries of the host; thus, he postulated that hemangiomas form as the result of misplaced matrix in the walls of developing blood vessels where they proliferate to form young sprouts.

Laidlaw and Murray, in 1933, proposed that angiomas might arise as phylogenetic remnants of early vascular tufts which serve as accessory

pulmonary tissue in the skin of reptiles and lower forms.

In an extensive study of patients with cutaneous hemangiomas Watson and McCarthy found that more than 73 per cent of the vascular lesions were present at birth. This strongly supports the theory for congenital origin of all vascular tumors.

According to Cockayne, there seem to be no long pedigrees showing a direct or indirect inheritance of any of the common forms of vascular tumors. The number of twins in which obvious angiomas have been present is too small to permit definite conclusions.

Comparatively little attention has been paid to the histologic changes which take place during the growth and development of hemangiomas.

The evolution of lesions appearing on the surface of the body has been exhaustively studied by Gross and Wolbach. They postulated the following factors which may influence or arrest the development of hemangiomas: first, a deficient blood supply may convert the surrounding tissue into a dense fibrous layer and thereby may produce perivascular and endovascular thickening of the endothelial lining with resultant progressive obliteration; second, endothelial cells may proliferate and become vacuolated into embryonic capillary hemangiomas; and, third, embryonic capillary hemangiomas may establish a connection with the circulation which, under pressure, causes the endothelium to become thinner and cavernous blood spaces to enlarge to form cavernous hemangiomas.

Capillary hemangioma. The capillary form of hemangioma consists of a new growth of small, closely packed blood vessels with well differentiated endothelium. Hyperplasia of these endothelial lining cells is a constant feature and may tend to obliterate the vascular spaces. The connective tissue stroma is deficient in elastin and muscular tissue. The general structure of the tumor is more embryonic than that of the cavernous hemangioma.

Capillary hemangiomas often appear as single, discrete, encapsulated tumors in the gastrointestinal tract. They arise from outpocketings of the submucosal vascular plexus and enlarge toward the lumen of the associated hollow viscus. Their outside diameter may vary from that of 1 by 1 cm. plaques to that of pedunculated tumors measuring 11 by 3 by 2 cm. which tend to cause intussusception and obstruction.

The capillary hemangiomas which develop in the esophagus and small intestine are generally smaller and produce symptoms earlier than those found in the stomach and colon. Ulceration of the mucosal surface was present in more than one half of the cases cited in the literature and in this study.

Differential diagnosis. Broders observed, in 1923, that it is sometimes difficult to distinguish melanoepithelioma from capillary hemangioma, especially if the endothelial cells have picked up blood pigment. Microscopic sections of a melanoepithelioma, when stained, will be iron-free, whereas those of a hemangioma contain iron.

Capillary hemangiomas are sometimes mistaken for hemangioendotheliomas. A study of their histopathology as it relates to invasion, metaplasia, atypical mitosis, and local or distant metastasis will assist in the differentiation.

Distribution, symptoms, and treatment. Data on 283 benign vascular tumors were collected from the literature and from the records used in this study. Eighteen, or 6 per cent, of these lesions were classified as capillary hemangiomas. These tumors were found to occur in every anatomic segment of the gastrointestinal tract.

The symptoms, complications, and treatment of capillary hemangiomas depend primarily on the specific location of the lesions in the gastrointestinal tract and will be considered in another section of this review; however, certain general observations are of interest when each separate group of pathologic lesions is considered. Sixteen, or 89 per cent, of the patients with capillary hemangioma experienced symptoms from chronic blood loss, perforation, or intestinal obstruction. Surgical extirpation was possible in 14, or 78 per cent, of the cases, whereas 2 patients died, one of esophageal perforation and the other, a 12 day old infant, of hemorrhage from a gastric hemangioma.

Mixed capillary and cavernous hemangiomas. The classification of hemangiomas depends primarily on grouping different lesions which have the same average cellular arrangement. A cut section through a mixed capillary and cavernous hemangioma presents solid areas of hyperplastic endothelial cells and semi-obliterated vascular spaces which alternate with large blood-filled sinuses lined by a single layer of endothelial cells and supported by connective tissue septa containing moderate amounts of elastin and sometimes muscular tissue.

The mixed capillary and cavernous hemangiomas, like the capillary hemangiomas, arise from the submucosal vascular plexus, are often encapsulated in a thin layer of fibrous tissue, tend to enlarge toward the lumen of the contiguous viscus, may become pedunculated, and frequently ulcerate through the overlying intestinal mucosa.

Eighteen mixed capillary and cavernous hemangiomas were found during this review. The majority were located in the stomach, small intestine, and appendix. It is interesting to note that in 8 of the patients clinical signs and symptoms of subacute intestinal obstruction developed. Surgical extirpation of the vascular lesion was successful in each of these cases. Two other patients in whom exploration was performed following a tentative diagnosis of acute appendicitis each had a primary vascular tumor of the appendix which had undergone torsion and infarction. Three patients died as a result of complications associated with mixed capillary and cavernous hemangiomas.

Cavernous hemangiomas. The cavernous forms of hemangioma consist of large blood-filled spaces or sinuses lined by single or multiple layers of endothelial cells. Their supporting stroma is composed of scant connective tissue septa which may contain smooth muscle fibers. These tumors, like the capillary hemangiomas, must be distinguished from lesions which develop after regenerative, inflammatory, or circulatory disturbances.

Growth occurs at the periphery of cavernous hemangiomas by angioblastic proliferation, dilatation of the capillary spaces, and fusion of the intervascular connective tissue walls to form septa. Degenerative and sclerosing changes may appear early in the evolution of these tumors and are represented by coagulation of blood in the cavernous spaces, overgrowth of fibrous tissue, hyalinization, edema, and foci of calcification.

Four histopathologic subdivisions of the cavernous tumors were made in this review.

1. Cavernous hemangiomas of the multiple phlebectasia type. Cavernous hemangiomas of this group are characterized by a multiplicity of small discrete lesions found in any or all segments of the gastrointestinal tract. As many as 50 separate tumors have been counted in a 20 cm. length of the small intestine. The majority of lesions are confined to the submucosa and rarely exceed 1 cm. in diameter.

A close association with the normal vascular segments of the bowel is easily demonstrated by compression of the tumors at the time of surgical treatment. They are seen to blanch and, with release of pressure, immediately to refill with blood. Moeller considered them to be baglike distentions attached to venous vessels at only one point; however, on careful examination of fixed specimens, more than one communication with the submucosal capillary network may be identified, and the lesions have the same multiplicity of associated sinuses and connective tissue septa and the same deficiency of elastin and muscular tissue as do other cavernous hemangiomas.

Increased venous pressure in the portal circulation might be considered an etiologic factor; however, no lesions have been observed in association with either Banti's syndrome or advanced cirrhosis of the liver. The lesions are consistently larger than the lesions obtained at biopsy from patients having multiple hereditary telangiectatic lesions and there is no known familial tendency.

The incidence of these lesions has been difficult to estimate since they are often disregarded in the postoperative notes and frequently are overlooked during postmortem examinations. Moeller found only 3 cases during 12,000 to 15,000 autopsies, whereas in our study of more than 10,000 autopsy reports, 49 cases were encountered. Reports of 94 cases were collected for this review; these cases represent approximately one third of all the benign vascular lesions found in the gastrointestinal tract.

The frequent occurrence of these lesions, contrasted with the rare occurrence of symptoms, might lead one to consider them as mere pathologic curiosities; however, 14 cases in which hemorrhage into the bowel or retroperitoneal space occurred have been cited in the literature. Three of the patients died.

The phlebectasia type of hemangioma generally involves long segments of the gastrointestinal tract. Consequently, surgical extirpation is impossible unless a definite bleeding point which can be locally excised is demonstrated. One patient from the Mayo Clinic series with hematemesis and melena during the previous years underwent exploration and was found to have numerous lesions in the small intestine. In this case snake venom was given in decreasing amounts for the succeeding 4 years with no further gastrointestinal bleeding. Study and further evaluation of this method of treatment is necessary.

2. Cavernous hemangiomas of the simple polypoid type. The simple polypoid hemangiomas appear as single isolated cavernous lesions associated with the submucosal vascular plexus. They may enlarge and prolapse into the lumen of the associated hollow viscus and thereby cause ulceration, hemorrhage, and intestinal obstruction.

The general incidence of these lesions is much lower than that of the preceding group; however, a larger proportion of cases has been reported because of the tendency of the lesions to produce gastrointestinal symptoms which require treatment. There were records of 14 cases at the Mayo Clinic and reports of 36 cases were found in the literature; thus, these 50 cases represent 10 per

cent of all the benign vascular tumors located in the gastrointestinal tract.

Eighty per cent of the polypoid cavernous hemangiomas encountered in this review produced gastrointestinal hemorrhage or obstruction.

Surgical extirpation was possible in more than 46 per cent of the cases. Four patients (8%) died.

3. Cavernous hemangiomas of the diffuse expansive type. Cavernous hemangiomas in this subgroup are characterized by great variation in size, shape, and effect on the immediate substrate. Many of these tumors are found to involve from 20 to 30 cm. of the gastrointestinal tract in one contiguous segment. Their gross appearance in the peritoneal cavity is determined by the structures covered by the expansive lesion, whereas in the rectum they produce soft, compressible, nodular, dark purple elevations under the mucosa.

Microscopic examination of sections through the periphery of these tumors reveals numerous dilated tortuous vessels as well as an abundance of smooth muscle and fibrous connective tissue stroma. One might therefore postulate the convergence of normal vascular structures in the antecedent history of these lesions. In other areas, however, the typical histopathologic pattern of cavernous hemangiomas is demonstrated, with no evidence of smooth muscle or elastic fibers in the connective tissue septa.

Records of 40 diffuse cavernous lesions were found, and 38, or 95 per cent, produced symptoms. Gastrointestinal bleeding was observed in 23 cases, while obstruction to the lumen of the bowel occurred in 14 others. The serious nature of these complications is emphasized by the fact that death occurred in 27 per cent of the cases.

Eighteen patients had diffuse cavernous hemangiomas in the small intestine. Five experienced severe gastrointestinal hemorrhage, while 5 others had symptoms from obstruction. Only 4 patients had both intestinal bleeding and obstruction. Resection of the tumor was possible in 8 cases, with 3 deaths. An exclusion type of operation was performed in 1 case, but the patient died of a severe hemorrhage from the remaining hemangioma.

The records of 20 patients with diffuse cavernous hemangiomas of the colon and rectum are summarized in Tables II and III. Seventy-five per cent of these lesions produced hemorrhage, while 25 per cent caused some degree of obstruction to the lumen of the bowel. Nine hemangiomas were excised, whereas colostomy with injection treatment or roentgen therapy was utilized in 2 other cases. An over-all mortality rate of 45 per cent from these tumors was observed.

In the majority of patients with a large cavernous hemangioma of the rectum the onset of hemorrhage is noted soon after birth. Severe bleeding recurs until some adequate form of treatment is instituted or the patient may die of profound shock early in life. The natural tendency toward conservative forms of treatment for these so-called benign lesions must be carefully weighed against the very high morbidity and mortality rates associated with symptomatic treatment. In general, the prognosis is grave unless resection of the rectum with excision of the associated tumor is undertaken or some type of colostomy is combined with extensive roentgen therapy.

4. Cavernous hemangiomas of the multiple diffuse expansive type. Diffuse cavernous hemangiomas may occur simultaneously in separate organs or tissues throughout the body. Sixteen cases in which multiple lesions occurred were found in this review. Two of the patients had hemangiomas of the stomach and similar lesions on the surface of the body. In each of the 14 others 1 diffuse expansive hemangioma was located in either the colon or rectum while a second and, rarely, a third cavernous hemangioma involved adjacent viscera within the peritoneal cavity or was located on the surface of the body.

Fifteen, or 94 per cent, of the patients had severe rectal hemorrhages. Gross hematuria was present in 2 cases in which cavernous invasion of the urinary bladder occurred.

The treatment given these patients was individualized to fit the location of the tumor and the severity of the complications. Three died of severe exsanguinating hemorrhages while another died of peritonitis following resection of the colon with excision of the associated tumor. One patient was free of symptoms after a combined abdominoperineal resection for a cavernous hemangioma. Five patients continued with hemorrhage in spite of conservative treatment.

MALIGNANT VASCULAR TUMORS

In spite of the fact that benign vascular tumors are exceedingly common, their transitional forms and malignant counterparts are rarely seen. In an extensive review of the literature, Stout felt compelled to reject many of the lesions labeled with some name suggestive of a malignant vascular tumor. This was done because of inadequate histologic reports or because he considered that the illustrations and text described a tumor of some other kind. On the other hand, Broders and many others (174, 233) have presented very detailed and carefully defined criteria for the classification of various malignant vascular neoplasms.

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE

Telangiectasia, Hereditary and Nonhereditary

Author, year	Sex, age	Location	Remarks
Osler (184) 1901	M 55	Lips, nose, stomach	Lesion 3 by 4 mm. Family history, positive. Epistaxis, coffee-ground vomitus. Death
Libert 1928	M 45	Stomach	Congested small veins in mucosa. Family history, positive. Melena. Gastroenterostomy. No gross ulceration. No further bleeding
Boston 1930	F 70	Stomach, neck, chest	Family history, questionable. Hematemesis and melena since childhood. Death from gastric hemorrhage
Boston 1930	M 32	Stomach, lips, face	Hematemesis and melena since childhood. Ligation of arterial supply to vascular area. No further bleeding for 5 years
Kessel 1931	M 53	Stomach, nose, lips	Possible telangiectasia. Melena. Partial gastrectomy. Continued bleeding. Family history, positive
Schuster 1937	F 62	Stomach, nose, pharynx	Recurrent gastric hemorrhages throughout life. Lesions found at autopsy. Family history, positive
Renshaw 1939	M 44	Stomach, lips, tongue	Recurrent pharyngeal and gastrointestinal bleeding for years. Seen at gastroscopy
Watson and McCarthy 1940		Stomach, lips	Repeated hematemesis. Family history, positive
Watson and McCarthy 1940		Stomach, pharynx	Death from gastric hemorrhage
Stellar 1942 (2 cases)	F(?) 56(?)	Stomach, nose, tongue	Repeated gastrointestinal bleeding. Lesions found at autopsy. Family history, positive
Wilson 1869		Gastrointestinal	Gastrointestinal bleeding
Fox 1908	F 18	Nose, trunk, gastrointestinal	Epistaxis and gastrointestinal bleeding, 8 years
Hutchinson and Oliver 1916	M 49	Mouth, rectum	Hematemesis and melena. Family history, positive
Richardson 1917		Nose, gastrointestinal	Gastrointestinal hemorrhages before onset of epistaxis
Barford 1926		Nose, gastrointestinal	Severe recurrent hematemesis, epistaxis, melena. Family history, positive
Becker 1926	M 50	Skin, mouth, tongue, gastrointestinal	Intermittent appearance of lesions. Recurrent epistaxis and melena. No family history
Harper 1929		Gums, tongue, gastrointestinal	Recurrent bleeding from tongue, tarry stools. Family history, positive
Boston 1930	M 56	Nose, gastrointestinal	Recurrent epistaxis and hematemesis. Family history, positive
Fitz-Hugh 1931	M 63	Nose, colon, rectum	Recurrent epistaxis and melena since childhood. Rectal biopsy, positive
Fitz-Hugh 1931	F	Nose, tongue, gastrointestinal	Recurrent epistaxis and melena
Goldstein (93) 1937 (2 cases)		Stomach	Family history, positive
Griggs and Baker 1941	M 69	Nose, skin, gastrointestinal	Recurrent epistaxis, hematemesis, and melena for 29 years. Skin biopsy
Griggs and Baker 1941	F 39	Skin, nose, mouth, gastrointestinal	Recurrent epistaxis, hematemesis, and melena since childhood. Multiple transfusions
Griggs and Baker 1941	F 50	Nose, pharynx, gastrointestinal	Recurrent epistaxis, hematemesis, and melena. Family history, positive
Figi 1942		Nasopharynx, gastrointestinal	Epistaxis and bright red blood in stools. Family history, positive

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE—Continued

Capillary hemangioma, simplex or single

Author, year	Sex, age	Location	Remarks
Vinson, Moore and Bowing 1926	M 70	Esophagus	[1]
Lammers 1893	M	Stomach	Incidental finding at autopsy. No symptoms
Stockis 1904–05	12 days	Cardia of stomach	Severe hematemesis and melena. Death
Eusterman and Senty 1922	F 20	Stomach	[1]
Eusterman and Senty 1922	M 50	Stomach	[1]
Eusterman and Senty 1922	M 67	Stomach	Reported by Lemon and by Judd and Rankin[1]
Judd and Rankin 1922	M 67	Stomach	Reported by Lemon and by Eusterman and Senty[1]
Judd and Rankin 1922	F 22	Stomach	Reported by Eusterman and Senty[1]
Judd and Rankin 1922	M 22	Stomach	Reported by Eusterman and Senty[1]
Siebner 1933		Cardia of stomach	Resection of stomach
Eusterman and Balfour 1935	F 22	Stomach	Reported by Eusterman and Senty and by Judd and Rankin[1]
Eusterman and Balfour 1935	M 50	Stomach	Reported by Eusterman and Senty[1]
Gladden 1942	M 40	Stomach	Lesion 1 by 1 cm. Found incidental to operation for stab wound
Carman 1921	F 22	Stomach (prolapse into duodenum)	Reported by Eusterman and Senty and by Judd and Rankin[1]
Balfour and Henderson 1929	F 22	Stomach	Reported by Eusterman and Senty, by Judd and Rankin and by Carman[1]
Rankin and Newell 1933	F 22	Stomach	Reported by Eusterman and Senty, by Judd and Rankin, by Carman and by Balfour and Henderson[1]
Oberndorfer 1929	M 43	Upper part of small intestine	
Lichtenstein and Dutra 1943	F 68	Ileum	"Angio-fibroma." Intestinal obstruction. Double intussusception, resection. No further symptoms
Weber 1936	M 48	Cecum	Beginning invagination of ileocecal area. Resection
Fobes 1938	F 53	Cecum	Fibrocapillary lipoma, 4.5 by 4.5 cm. Pain, cramps, and vomiting. Intussusception of cecum. Resection. Recovery
Sawyer 1939	M 55	Sigmoid colon	Lesion 2.5 by 0.5 cm. Intestinal obstruction. Melena. Mikulicz resection. Recovery
Edwards 1908	F 48	Extrarectal	Angiofibroma. Enlargement for 2 years. Resection. Recovery
Forssner 1926	F 50	Rectum, rectovaginal septum	Hemangioma. Tumor protruding at vulva, 2 years. Rectovaginal fistula. Resection. Recovery

Mixed capillary and cavernous hemangioma

Morton and Burger 1941	F 36	Stomach	Cavernous hemangioma. Endothelial proliferation

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE—Continued

Mixed capillary and cavernous hemangioma—continued

Author, year	Sex, age	Location	Remarks
Laboulbéne 1872	M 64	Duodenum	Erectile tumor. Capillary spaces and saccular dilatations. Recurrent hematemesis and melena. Death from massive hemorrhage
Moore and Schmeisser 1934	M 58	Duodenum	Diffuse annular hemangioma. Persistent chronic gastrointestinal hemorrhage. No operation. Death
Sussig 1923–1924	M 3 mo.	Jejunum	Hemangioma, thick-walled vessels and partly large spaces. Invagination. Resection. Recovery
Raiford 1932	M 60	Jejunum	Hypertrophy of blood vessels and cellular infiltration. Anorexia, weight loss, increasing constipation, pain, vomiting, hematemesis, 6 months. Occlusion of lumen of jejunum
Merchant 1939	F 67	Jejunum	Small capillary and large vascular spaces (3 by 3 cm.). Intestinal obstruction. Death while in shock from bleeding and intussusception of polypoid tumor
Miescher 1928	32	Appendix (17 cm. in length)	Angiofibroma, all portions of the vascular system reproduced. Symptoms of acute appendicitis, torsion of tumor of appendix
Quain 1855	3	Rectum	Pedunculated, spongy vascular tumor. Half teaspoon of blood lost with each bowel movement. Resection. Recovery
		Cavernous hemangioma, multiple phlebectasia type (small cavernous)	
Sommer 1896	F 76	Esophagus and rectum	Multiple small cavernous lesions in submucosa. No digestive symptoms. Death from infection of hand
Bennecke 1906	M 52	Entire gastrointestinal tract	Submucosa, communicating blood filled cavities. Death from tuberculous meningitis. No known digestive symptoms
Dickes, Knudsen and Franco 1942	F 10	Esophagus	Many endothelium-lined polypoid spaces. Hematemesis at 3 and melena at 10 years of age. Splenectomy. Return of bleeding. Esophagoscopy: biopsy and fulguration of tumors. Well 1 year after treatment
Lilie 1879	M 66	Stomach and upper part of jejunum	Multiple hemangiomas. Death from senile gangrene and bronchopneumonia
McClure and Ellis 1930	F 30	Stomach, jejunum, liver, and spleen	Multiple hemangiomas (2 mm. to 15 mm.). Recurrent severe gastrointestinal bleeding, 10 years. Intussusception of one tumor. Operation. Death from hemorrhage from intestine
Merchant 1939	M 8	Stomach, jejunum, left kidney, and adrenal	Multiple hemangiomas (1.5 by 1.5 cm.). Anemia, 8 years. Intussusception of jejunum. Operation. Death
Obkubo 1907	M 79	Small intestine	Multiple hemangiomas. No known gastrointestinal symptoms. Death from pneumonia
Ackerman 1937	M 81	Duodenum, jejunum, colon, gall bladder	Multiple cavernous hemangiomas. Anemia. Occult blood. Death from retroperitoneal rupture of duodenal hemangioma. No mucosal ulceration
Gascoyen 1860	M 40	Body surface, small intestine	Multiple cavernous hemangiomas. Death from suffocation with enlarging angioma of parotid gland
Thierfelder 1873	M 48	Small intestine	Cavernous hemangiomas. No clinical symptoms. Death from trauma
Thierfelder 1873	M 45	Small intestine	Multiple hemangiomas. No clinical symptoms. Death from variola
de Boyer 1877	M 62	Small intestine	Multiple hemangiomas. No clinical symptoms. Death from pneumonia. Fifty hemangiomas
Lilie 1879	M 55	Jejunum, colon, rectum	Multiple submucosal hemangiomas. No clinical symptoms. Death from cancer of colon
Lilie 1879	M 65	Small intestine	Multiple hemangiomas. No gastrointestinal symptoms. Death from pulmonary tuberculosis
Orff 1880	M 63	Small intestine, colon	Multiple hemangiomas. No intestinal symptoms. Death from infection
Hektoen 1897–1899	M 48	Small intestine	Dilated veins, cavernous hemangiomas. No intestinal symptoms. Death from mitral endocarditis
Mac Callum (151) 1906	M 54	Small intestine	Multiple hemangiomas. Alcoholic, vomited blood one time. Digestive disturbance for 6 months. Death from pneumonia
Moeller 1917	M 35	Jejunum	Multiple hemangiomas. Death from carcinoma of esophagus
Moeller 1917	M 46	Small intestine	Multiple hemangiomas. Death from trauma. No intestinal symptoms

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE—Continued

Cavernous hemangioma, multiple phlebectasia type (small cavernous)—continued

Author, year	Sex, age	Location	Remarks
Moeller 1917	M 47	Small intestine	Multiple hemangiomas. Infectious diarrhea
Schmincke 1924	M 42	Small intestine	Multiple hemangiomas
Staemmler 1924	M 67	Small intestine	Multiple hemangiomas. Death from carcinoma and myoma of ileum
Staemmler 1924	M 65	Jejunum	Multiple hemangiomas. No gastrointestinal symptoms
Saint 1927		Small intestine	Multiple hemangiomas[1]
Toepfer 1928	2 mo.	Intestine	Multiple simple angiomas with capillary "ectasia." Also skin, mouth, submaxillary gland, thyroid, liver, lungs, urinary bladder involved.
Jaffé 1929	F 10 mo.	Small intestine, sigmoid	Multiple blood-filled spaces. Death from acute suppurative condition and meningitis. Also skin, thyroid, lungs involved
Raiford 1932	M 54	Jejunum	Numerous hemangiomas. Death from bronchopneumonia
Dudley 1934	M 56	Small intestine studded	Multiple hemangiomas (0.5 by 1.0 cm.). No symptoms one year after operation
Brulé and others 1934	M 65	Small intestine, colon, rectum	Multiple hemangiomas. Gastrointestinal bleeding. Preoperative diagnosis of "ulcer." Seen with proctoscope
Bensaude, Hillemand and Genestoux 1935	F 55	Jejunum, sigmoid	Multiple hemangiomas. Many episodes of melena. No resectable lesion found on exploration
Ackerman 1937	M 64	Ileum, jejunum	Six cavernous hemangiomas. Seen at autopsy
Merchant 1939	M 64	Jejunum	Multiple hemangiomas. No known gastrointestinal symptoms. Death from hypertensive heart disease
Sipovsky 1941		Ileum	Multiple cavernous hemangiomas
Lilie 1879	M 26	Colon	Multiple hemangiomas. Death from infection in various organs
Neelsen 1879	M 56	Colon	Multiple hemangiomas. Psychosis. Death
Moeller 1917	M 54	Sigmoid, mesocolon	Multiple hemangiomas. Death from carcinoma of esophagus
Staemmler 1924	M 78	Colon	Multiple hemangiomas
Tønnesen 1931	M	Ascending colon	Multiple hemangiomas. Carcinoma, tuberculosis, and ileocecal invagination
Latten 1935		Gastrointestinal tract	Multiple cavernous hemangiomas
Amundsen 1938		Gastrointestinal tract	Multiple cavernous hemangiomas
Carnot 1929	37	Esophagus	Cavernous hemangioma on pedicle. Two severe episodes of hematemesis in 6 months. Death from shock from hemorrhage of tumor
Cecchiere 1932		Esophagus	
Rokitansky (209) 1855		Stomach	"Erectile" tumors. May have been attached by broad base
Judd and Rankin 1922	F 25	Stomach	Reported by Eusterman and Senty[1]
Eusterman and Senty 1922	F 25	Stomach	Reported by Judd and Rankin[1]
Eusterman and Balfour 1935		Stomach	Reported by Judd and Rankin[1]

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE—Continued

Cavernous hemangioma, multiple phlebectasia type (small cavernous)

Author, year	Sex, age	Location	Remarks
Judd 1929	F 37	Duodenum	Reported by Rankin and Newell[1]
Raiford 1932	F 19	Duodenum	Hemangioma. History of anemia. Hemangioma removed from tongue at 7 years of age. Resection of hemangioma of duodenum. Improvement
Rankin and Newell 1933	F 37	Duodenum	Reported by Judd[1]
Virchow 1863		Jejunum	Specimen in Guy's Hospital Museum
Koester 1879		Small intestine	
Nicoll 1899	F 23	Small intestine	Intestinal obstruction. Double intussusception, resection. Recovery
Shillito 1921	M 27	Ileum	Recurrent pain, mass, blood in stool. Resection. Recovery
Helvestine 1923	F 72	Jejunum	No intestinal symptoms. Death from pneumonia
Aresu 1924	M 40	Small intestine	Ileus. Resection of 17 cm. of bowel. Recovery
Kaufmann 1929	M 54	Ileum	
Kaufmann 1929	M 62	Small intestine	Invagination
Kuhle 1932		Small intestine	
Klein 1936		Small intestine	
Kaspar 1936	M 15	Small intestine	Massive intestinal hemorrhage. Resection. Recovery
Ackerman 1937	M 70	Jejunum	Incidental finding at autopsy. Lesion 0.5 by .025 cm.
Stein 1937	M 46	Jejunum	Constant epigastric pain, 6 weeks. Weight loss, vomiting. No melena. Resection. Recovery
Jagar 1941		Jejunum	Fatal hemorrhage
Christopher 1942	F 26	Ileum	Lesion 2 by 0.5 inch. Severe melena and anemia, 2 months. Transfusions. Resection. Mucosal ulceration. Recovery
Segal *et al* 1945	M 23	Ileum	(Lesion 3 by 3 mm.) Epigastric pain, tarry stools. Mucosal ulceration. Local excision. Recovery
Tuffier 1913	M 31	Sigmoid	Ulcerated cavernous hemangiomas. Recurrent rectal hemorrhages, 24 years. Sigmoidoscopy: lesion at 22 cm. cauterized. Laparotomy: no tumor found. Death from hemorrhage from hemangiomas
Corten 1924		Cecum	Hemangioma
Quain 1855 (2 cases)	M, ? 10,3	Rectum	Red pedunculated vascular polyp. Bleeding for 5 days. Ligature excision. Recovery
Leboucq 1875	F	Rectum	Cystic angioma
Hartmann (105) 1913	F 22	Rectum	Small hemangioma. Rectal hemorrhages. Proctoscopy and cauterization. Recovery
Cabot case (46) 1927	M 35	Rectum	"Inflamed angiomatous rectal polyposis." Bleeding for 7 years, abdominal pain. Colostomy, local radium, high voltage roentgen therapy. Stricture of bowels. No recurrence in 2 years
Kaufmann 1929	M 39	Rectum	
Kessel 1931	F 45	Rectum	Hemangioma. Recurrent hemorrhage, transfusions. Proctoscopy, cauterization. Symptom-free 2 years later

[1]Clinical details given in Table 3.

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE—Continued

Author, year	Sex, age	Location	Remarks
Cavernous hemangioma, multiple phlebectasia type (small cavernous)			
Gabriel 1937	M 19	Rectum	Rectal hemangioma. Recurrent rectal hemorrhage since 3 years of age. Resection. No hemorrhage after 2 months
Phillips (192) 1839	M 18	Anus	"Erectile tumor." Rectal hemorrhages. Irritation made it tense and turgid. Ligature, slough. Recovery
Guersant 1840		Anus	"Erectile tumor"
Syme 1854	M 18	Anus	Vascular tumor, 2 by 4 inches. Soft red tumor present since birth. Recurrent severe hemorrhages. Ligature. Removal. Recovery
Rokitansky (209) 1855		Colon, rectum	Mentioned a blood-vascular new growth in his pathology text
Paci 1882	F 60	Gastrointestinal tract	Intestinal obstruction. Tumor torn loose from bowel during violent purging. Hemorrhage. Recovery
Cavernous hemangioma, diffuse expansive type (single contiguous)			
Kegaries 1933		Esophagus	Saccular dilatations, hemangioma[1]
Wakeley 1925	F 62	Liver; extrinsic pressure on esophagus	Increasing dysphagia, 5 years. Vomiting. Hemangioma the size of a closed fist removed from liver with diathermy. Recovery
Morton and Burger 1941	M 36	Cardia of stomach	Lesion 6.5 by 1 cm. Epigastric pain, 1 year. Gastroscopy: polypoid mass on lesser curvature. Operation: numerous large tortuous blood spaces. Resection not attempted
Beer 1915	F 19	Duodenojejunal junction	Lesion 36 by ½ inch. Increasing weakness, hematemesis, melena, 5 years. Duodenojejunostomy with exclusion of bowel and cavernous hemangioma. Postoperative hemorrhage, death
Delbet 1899	F 21	Small intestine	Lesion 3 by 3 cm. Chronic, subacute intestinal obstruction, long duration. Resection. Death
Roedelius 1923	F 36	Jejunum	Lesion 8 cm. long. Recurrent attacks of abdominal pain. Resection. Recovery
Brown 1924	F 12	Jejunum	Lesion 5 by 5 inches. Recurrent abdominal pain, vomiting and distention, a few months. Resection. Death
Landois 1925	F 25	Ileum	Lesion 8 cm. long. Symptoms simulating acute appendicitis. Resection. Recovery
Michaëlsson 1927	F 3 mo.	Ileum	Severe vomiting, bloody stools, and palpable mass. Resection. Death from peritonitis
Bassett 1930	M 33	Jejunum	Mucosal ulceration. Whole small intestine filled with blood at autopsy. Death from pulmonary tuberculosis
Kortzeborn 1930	M 41	Small intestine	Lesion 15 cm. long. Intestinal bleeding. Resection. Recovery
Peyton 1938	M 15	Jejunum, ileum	Pale, weak, severe anemia since birth. Exploration. Postoperative high voltage roentgen ray. No hemorrhage for 8 months
Pierose 1940	F 40	Jejunum	Diffuse hemangioma. Bright red blood passed 3 days after birth. Weakness, tarry stools, anemia, 15 years. Three abdominal explorations. Resection. No further symptoms
Morrison and Donath 1941		Jejunum	Lesion 60 cm. Two explorations, negative. Diagnosis after extensive roentgenologic examination
White 1941	M 12	Ileum	Lesion 5 inches long. Abdominal distress and severe intestinal hemorrhage. Resection. Recovery
Stajano 1941	F 16	Jejunal mesentery	Did not involve gastrointestinal tract
Packard 1945	F 16	Ileum	Lesion 8 by 4 by 1.5 cm. Frequent episodes of nausea, vomiting, cramps, marked weakness, and dark stools. Resection. Recovery
Buie and Swan 1929	F 47	Appendix, cecum	Reported by Hunt[1]
Kaufmann 1929	M 32	Cecum	Hyperplastic angioma (8 by 8 cm.). Intestinal obstruction. Intussusception. Resection. Recovery
Hunt 1941	F 47	Appendix, cecum	Reported by Buie and Swan[1]

[1]Clinical details given in Table 3.

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE—Continued

Cavernous hemangioma, diffuse expansive type (single contiguous)

Author, year	Sex, age	Location	Remarks
Ewald 1911		Colon	Hemorrhage
Bensaude and Antoine 1923	F 21	Rectum, sigmoid	Lesion 30 cm. long. Onset of rectal bleeding 1 month after birth. Severe anemia and cachexia. Colostomy. Roentgen therapy
Bensaude and Antoine 1923	M 48	Rectum, sigmoid	Lesion 15 cm. long. Six profuse rectal hemorrhages, 29 years. Death from hemorrhage. Case cited also by Lockhart-Mummery
Rankin 1926	F 48	Colon	Reported by Buie and Swan[1]
Lockhart-Mummery 1927	M 41	Rectum, sigmoid	Case cited above by Bensaude and Antoine
Buie and Swan 1929	F 48	Colon	Reported by Rankin[1]
Kaijser 1936	M 8	Sigmoid	Lesion 4 by 3 by 3 cm. Rectal hemorrhages since 2 years of age. Resection of sigmoid and tumor. Recovery
Hunt 1941	F 39	Sigmoid, rectum, uterus	Hemorrhages from rectum since birth. Subtotal hysterectomy and combined abdominoperineal resection. Recovery
Barnes 1879	F	Rectum	Obstructed labor. Removed with galvanic cautery
Barker 1883	M 45	Rectum	"Cavernous nevus" 11.5 cm. long. Constipation alternating with diarrhea and hemorrhage since youth. Injection of Tr. Fer. Perchlor. Death from hemorrhage
Marsh 1883	F 10	Rectum	Lesion 4 cm. long. Rectal hemorrhages since 2 years of age. Cauterization did not cure growth
Longuet 1898	F 10	Rectum	Reported by Marsh
Martin 1902	Adult	Rectum	
Adler 1909	M 40	Perianal, rectum	External anal fullness since birth. Excision of tumor. Death
Kausch 1917	M 17	Rectum	Rectal hemorrhages since first year. Colostomy, posterior excision of tumor. Improvement
Borchgrevink 1916	M 41	Rectum	Fatal rectal hemorrhage. Lymphangioma of spleen
Judd and Rankin 1922	F 7	Bladder, rectum	1
Hume 1922	M 48	Rectum	Rectal hemorrhages, 36 years. Transfusions, packing of rectum with kaolin paste. Death from hemorrhage
Henning and Schuett 1923	M 23	Rectum	Rectal hemorrhages 16 years. Operation for lymphangioma of knee. Postoperative rectal hemorrhage. Death
Bancroft 1931	M 17	Rectum	Constipation, diarrhea, severe rectal bleeding since 15 months of age. Colostomy, ligation, and injection of superior hemorrhoidal vein. Colic stoma closed. Minimal bleeding 3 months
Cain and Lévy 1936	M 48	Rectum	Followed by proctoscopy. Allegedly no change after roentgen therapy
Hellstrom 1937	F 29	Sigmoid, rectum	Melena all life. Combined abdominosacroperineal resection. Recovery
Bensaude and Bertillon 1938	9 mo.	Anorectal	Postulated that radium therapy would be useless and might be very harmful
Blank 1908		Stomach, small intestine	Associated hemangiomas of thigh and liver. Death at time of operation on thigh
Kaijser 1936	F 19	Axilla, lips, tongue, esophagus, liver	Recurrent attacks of severe anemia, dyspnea, tarry stools, and hematemesis since 4 years of age. Abdominal exploration. Roentgen therapy to stomach through four portals
Homans 1897	F 22	Spleen, omentum, colon	Increasing size of abdomen for 1 year. Paracentesis. Partial resection of tumor. Death while in shock

[1]Clinical details given in Table 3.

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE—Continued

Author, year	Sex, age	Location	Remarks
Cavernous hemangioma, diffuse expansive type (single contiguous)			
Stacy 1918	F 21	Uterus, colon, rectum	Severe rectal hemorrhages. Sigmoidoscopy. Laparotomy. Death during shock
Dujarier and Topous Khan 1920	M	Sigmoid, colon	Intermittent rectal hemorrhages, anemia, weight loss
Rainey 1938		Colon, para-aortic area	Recurrent attacks of bleeding and diarrhea throughout life. Death from staphylococcus septicemia
Watson and McCarthy 1940	1½	Kidney, colon	Same case as Dean and McCarthy given below
Dean and McCarthy 1940	1½	Right leg, sigmoid, colon	Cited by Watson and McCarthy
Gant 1923 (2 cases)		Rectum	Hemorrhage from slightest trauma since infancy
Withers and Ranson 1927	F 11 mo.	Buttocks, vagina, rectum	Defecation impossible since birth without enema. Rectal hemorrhages. Radium tubes and radon seeds applied and growth regressed
Esau 1931	M 21	Scrotum, rectum, penis	Bleeding since infancy. Operation. Recovery
Bensaude and co-workers (26) 1932	M 44	Perineum, scrotum, penis, rectum	Rectal hemorrhage all life. Vasoconstrictor drugs and radium therapy. Operation refused
Bensaude and co-workers (26) 1932	M 42	Perineum, scrotum, penis, rectum	Bleeding from rectum since 16 years of age. Symptomatic treatment
Buie and Nesselrod 1938	M 28	Rectum, kidney	Death from hemorrhage from rectum[1]
Bensaude and Bertillon 1938	M 30	Anus, rectum, scrotum	Alternating constipation and diarrhea. Some bleeding from rectum
Hemangioma, details insufficient for classification			
Bouchard 1902	F	Esophagus	"Nevus." Alcoholic, cirrhosis, cutaneous nevi, death from hematemesis. Perhaps esophageal varices
Guisez 1913	M	Esophagus or stomach	Vascular tumor. Increasing dysphagia, 12 months. Esophagoscopy. Esophageal bougies and local application of radium gave an ultimate satisfactory result
Anschuetz and Konjetzny *et al* 1921		Stomach	Alleged hemangioma.
Eliason *et al* 1926		Stomach	Listed on chart only
Gutmann *et al* 1932	M 45	Stomach	Possible hemangioma. Severe hematemesis and melena. Gastroenterostomy. Bleeding continued. Nevi of face and thorax
Geschickter 1935		Stomach, small intestine, rectum	Listed on chart from Johns Hopkins Hospital
Minnes and Geschickter 1936	M 55	Stomach	Pain, vomiting, weight loss, death from gastric cancer
Martini 1941	55	Stomach	"Angiomatosis." Associated with heredosyphilitic capillaritis
Wesener 1883	M 55	Duodenum	"Telangiectatic," 7 by 3.5 cm. Vascular tumor continuous with another tumor which rested upon the pancreas compressing the common bile duct
Hartman (104) 1935		Ileum	[1]
Petacci 1938 (2 cases)	M? 9,27	Cecum	Angioma, infarction of cecum. Ileotransverse colostomy. Resection of cecum. Recovery

[1]Clinical details given in Table 3.

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE—Continued

Hemangioma, details insufficient for classification

Author, year	Sex, age	Location	Remarks
Carbonell Salazar 1939 (2 cases)		Small intestine	Angiomas
Klein 1936		Appendix	Solitary hemangioma
Anderson 1898	M 18	Gastrointestinal	Telangiectasia. Intermittent rectal bleeding, source not known
Reichel and Staemmler 1924	M 78	Colon or rectum	Seen at autopsy
Valerio 1934		Rectum	Angioma and angiomatosis
Doub and Jones 1941		Small intestine	Listed in chart of benign tumors
Carrara 1910		Esophagus	Tumor found at autopsy
Broders 1933	F 76	Esophagus	[1]
Chosrojeff 1912		Stomach	
Sherrill and Graves 1915	F 31	Stomach	External trauma. Mass and tenderness. Nausea, hematemesis, pain, melena. Resection of tumor
Dahlgren 1934	M 44	Stomach	Hematemesis. Large firm nontender epigastric mass. Tumor excised with piece of gastric wall
Lemon and Broders 1942	F 10	Stomach	Not reported in detail[1]
Blahd *et al.* 1923	F 2 mo.	Ileum	Lesion 3 by 3 cm. Vomiting, obstipation, and distention, 4 days. Ileostomy because of condition. Death
Wollstein 1931	F 5 mo.	Small intestine, lungs, other viscera	Wheezing respiration. Cyanosis since 7 weeks of age. Death
Magnusson 1934	F 60	Jejunum	"Ulcerated hemangiosarcoma," 5 by 6 cm. Anemia, lower abdominal pain, few weeks. Surgical removal but metastasis found in regional nodes. Stout and others believed it was hemangioendothelioma
Mayo 1940		Ileum	[1]
Mac Callum (152) 1940		Small intestine	Recurrent melena. Metastasis to liver
Smith and Broders 1935	F 69	Anus	[1]
Smith and Broders 1935	F 48	Rectum	[1]
		Endothelioma	
Jungmann 1892		Stomach	Lesion 15 by 10 by 8 cm. Dahlgren and Chosrojeff refer to this as a case of hemangioendothelioma
Huenermann 1898	M 69	Stomach	
Brissaud 1900	34	Stomach	Alcoholic with vomiting, pain, dyspepsia of 6 years' duration. Operation
Ssobolen 1900	M 28	Stomach	Dahlgren refers to this case as possible hemangioendothelioma
Oettinger 1902	M 37	Stomach	Ten years of epigastric distress. Epigastric fullness and vomiting, 3 years. Operation
Cignozzi 1905		Stomach	This case excluded by Bagger-Jorgensen, Donath, and Dahlgren. It appears uncertain as to whether it deals with an endothelioma

[1]Clinical details given in Table 3.

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE—Continued

Author, year	Sex, age	Location	Remarks
Endothelioma			
Donath 1909		Stomach	
Morris 1910		Stomach	Posterior gastroenterostomy to relieve pyloric obstruction. Under roentgen therapy the growth "apparently disappeared entirely." Patient gained 50 pounds
Bagger-Joergensen 1911		Stomach	
Fontana 1928		Stomach	Lymphangioendothelioma
Olinder 1929 (2 cases)		Stomach	
Baumecker 1930	M 60	Stomach	
de Aragón 1922		Cecum	Symptoms simulating acute appendicitis
Lehman 1925		Intestine, liver	Diffuse thickening of the entire intestine with secondary growths in the liver
Kaposi's sarcoma			
Winternitz and Boggs 1910	M 67	Esophagus, stomach, duodenum, small and large bowel	"Malignant degeneration" of visceral hemangiomas. Hematemesis. Death. Also skin, liver, spleen involved. Alleged by many authors to have been a case of Kaposi's sarcoma
Kaposi 1872		"Bowel lesions"	Commented on bloody diarrhea in his 1 necropsy case
Semenow 1897 (2 cases)		Stomach, colon	Pancreas and kidney also involved
Mariani 1909		Stomach, small intestine, colon	
Della Favera 1911 (2 cases)		Stomach and intestines	Eight years' duration. Trachea and bronchi also involved
Dillard and Weidman 1925	M 82	Stomach and intestines	Six year progressive appearance of cutaneous lesions. No known gastrointestinal symptoms. Neck, legs, urinary bladder involved
Kusnezow 1933	M 32	Stomach, duodenum, ileum, cecum, and rectum	First nodule appeared on toe. Progressive appearance for 5 years. Back, face, extremities involved. Death
Symmers 1941	M 61	Stomach, duodenum, entire small intestine	Lumps on extremities for 11 years. Nausea and abdominal cramps. Death
Lieberthal 1920		Intestines, extremities	Mentioned visceral involvement. No details given
Grigorjew 1924		Small intestine	Extremities also involved
Paolini 1928		Small and large bowel	Clinical disturbance of gastrointestinal tract before skin lesions noted
Aegerter and Peale 1942		Ileum	Lesions of feet for 2.5 years. Roentgen therapy: progress of disease not altered
Busman 1922			Skin lesions present 6 years. Gastrointestinal hemorrhages, 3 years. Death
"Benign metastasizing hemangioma"			
Ullman 1896	F 40	Intestines, rectum	"Capillary angiomas." Purple lesions of face developed. Biopsy: "Cavernous angiomas." Four years later onset of bronchial and gastric hemorrhage. Death
Stamm 1891	F 4 mo.	Small intestines	"Angioma simplex," endothelial hyperplasia. Death during operation for attempted extirpation. Skin, lungs, cerebral cortex involved
Ullmann 1900	F 49	Intestines	"Cavernous hemangioma." Death from infection. Skin, other internal organs involved
Konjetzny 1912	4	Intestine	"Histologic appearance of cavernous hemangioma." Lesions in the lung, liver, and intestines considered metastatic. Death

TABLE II.—PUBLISHED CASE REPORTS OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT ACCORDING TO TYPE—Concluded

Angiosarcoma

Author, year	Sex, age	Location	Remarks
Philippson 1902		Stomach, appendix, colon	Thirty-four months' duration. Eye, nasopharynx, spleen, testicle also involved
Theile 1904	M 56	Stomach	Large abdominal tumor palpated. Abdominal exploration of internal hemorrhages. Death. Spleen, liver, lungs also involved
Burty (211) 1914	F 58	Stomach	Sarcomatous angioma. Abdominal pain, few months. Operation
Molotkoff 1933	F 36	Stomach	Pain in right quadrants, anorexia, jaundice, 2 months. Death. Primary lesion in liver with metastasis to lungs and stomach
Freilich and Coe 1936	M 61	Intestines	Pain in right shoulder, 6 months. Biopsy. Radium therapy. Died with extensive metastasis to lungs, spleen, liver, and intestines
Phillips and Rivers 1939	F 28	Stomach	Angiofibrosarcoma. Discussion, section on pathologic diagnosis

There are few forms of new growth about whose nature there has been so much divergence of opinion as is evidenced in the literature on malignant vascular tumors.

Classification of these tumors which involve the gastrointestinal tract may be made into five main groups: endotheliomas, with no further descriptive terminology; hemangioendotheliomas; "benign metastasizing hemangiomas," considered by many pathologists as malignant; Kaposi's sarcomas; and angiosarcomas.

Endotheliomas. In 1869 Golgi introduced the term "endothelioma" to describe a group of tumors which form endothelium-lined spaces. Soon after this original article was published a large number of tumors were classified under this title; however, as the genesis of many epithelial, purely sarcomatous, and mixed-cell types of tumor has been worked out, this terminology has been retained for only a few lesions.

This type includes those whose obvious morphologic features determine the true endothelial nature of the cells, and any tumor now classified as an "endothelioma" requires a certain cell type of mesenchymal origin, must be capable of forming intercellular mesenchymal fibrils, and must have the inherent growth characteristic of demonstrating an alveolar nature or rudimentary lumen-forming elements.

No malignant vascular lesions of the gastrointestinal tract are now classified solely under this heading at the Mayo Clinic; however, a large group of tumors of historical and pathologic interest are thus described in the literature and will be reviewed in this and another section of the study.

Data on 61 malignant vascular tumors of the gastrointestinal tract have been collected in this review. Fourteen of the lesions reported in the literature were termed "endothelioma." Twelve were located in the stomach, 1 was in the cecum, and 1 was vaguely described as occurring in the intestine and liver.

Two patients with endothelioma of the stomach experienced a sensation of epigastric pressure and fullness for from 6 to 10 years before pyloric obstruction developed.

A gastric resection was followed by complete relief of the symptoms in 2 cases, whereas in a third case the tumor was considered too extensive for removal and gastroenterostomy was undertaken to avoid further obstructive symptoms. The endothelioma in the third case allegedly disappeared after roentgen therapy.

An endothelioma of the cecum caused symptoms simulating acute appendicitis and was removed.

Perhaps the histopathologic classification of these tumors would be modified if the tumors were re-examined with more recent and rigid criteria; therefore, any conclusions regarding methods of treatment and prognosis must necessarily be limited.

Hemangioendothelioma. The majority of malignant tumors which form vascular tubes, which have endothelial cells in their basic stroma, and which demonstrate aggressive growth characteristics, including metastasis, were termed "hemangioendotheliomas" by Mallory in 1908.

Stout, in 1943, listed the modern theories of histogenesis and pathology which assist in the classification of hemangioendotheliomas.

In the gastrointestinal tract hemangioendotheliomas are usually situated in the submucosa, they are lobulated, they are accurately delimited with alternating soft and firm regions, and they some-

times present areas of degeneration. In the stomach and colon they tend to be pedunculated and may extend into the lumen for a distance of 2 or 3 cm.

The histopathologic features of these hemangioendotheliomas include those of vascular tubes and sinuses lined by atypical fusiform and oval-shaped endothelial cells which contain scattered mitotic figures together with occasional giant cells and a delicate fibrous framework which may be clarified by use of the Gomori reticulum stain. The highly anaplastic hemangioendotheliomas contain numerous mitotic figures and exhibit an extreme degree of atypical endothelial hyperplasia characterized by closely packed cords or masses of cells without evidence of capillary or sinus formation.

Most authors agree that metastatic lesions from hemangioendotheliomas occur first in the regional lymph nodes, and because of this fact, together with the definite tendency toward encapsulation, there is increased opportunity for their complete surgical eradication, with a more favorable prognosis.

Incidence and distribution. The vascular lesions classified in this group represented 35 per cent of all malignant tumors encountered in this review. They were found in every segment of the gastrointestinal tract although a large majority appeared in the stomach and small intestine.

Symptomatology, treatment, and prognosis. The symptoms produced by hemangioendotheliomas, like those of the other vascular tumors which involve the gastrointestinal tract, depend to a large extent on the location of the lesion. The treatment as well as the prognosis is also conditioned by the location and by the grade of malignancy.

The hemangioendotheliomas involving the esophagus produced severe dysphagia, progressive malnutrition, and death following perforation and mediastinitis.

The average age of the 9 patients with hemangioendotheliomas of the stomach was 48 years. Four patients were under 32 years of age.

Anorexia, weight loss, and vague symptoms of so-called indigestion were noted in 6 cases, while gastric bleeding, severe anemia, and associated progressive weakness were observed in 8 others. The average duration of symptoms was more than 3 years in 6 of the cases while in the other 3 cases the patients were examined before their symptoms had been present for a year.

Local excision of the tumor was possible in 6 cases, while a partial gastrectomy was undertaken in 2 others.

Six patients were followed up carefully and 3 of these were free of symptoms more than 20 years after removal of the tumor. The fourth patient was living and well 4 years after surgical treatment, while the fifth patient died as the result of another disease 7 years after removal of the gastric lesion.

In 4 patients with hemangioendothelioma of the duodenum or small intestine, signs and symptoms of obstruction developed, while in 3, bleeding from ulcerations on the mucosal surface of their tumor occurred.

In only 4 of the 6 cases of hemangioendothelioma of the duodenum or small intestine was exploration performed and the lesion excised. One patient died of surgical complications and 2 patients were not followed up over a long period of time.

Rectal swelling, tenesmus, and bleeding were observed in 2 patients with hemangioendotheliomas located just above the anal margin. The first patient was living and well with no rectal complaints 13 years after local excision and radium therapy for a low grade lesion (Broders' classification). The second patient was found to have fluid in the thorax from a metastatic grade 3 hemangioendothelioma of the rectum. He failed rapidly in spite of local radium packs applied to the rectal lesions and extensive roentgen therapy over the chest.

Many of the hemangioendotheliomas appear in young adults who may give a history of relatively long duration of symptoms. The prognosis is excellent for patients who have low grade lesions which are surgically excised and followed by extensive radiation therapy. The higher grade lesions metastasize early to both local and distant parts of the body and are not cured after removal of the primary growth or with extensive adjunctive radiation therapy.

"*Benign metastasizing hemangiomas.*" Another group of vascular tumors which have given rise to a considerable amount of discussion in the literature are the so-called "benign metastasizing hemangiomas." They are characterized by extensive metastasis in spite of a seemingly benign histologic pattern. The existence of such a group has an intimate bearing on the question of the essential similarity of all benign and malignant processes. Some authors have attempted to discredit altogether the criteria by which these lesions are classified as benign.

Pathogenesis. Lubarsch raised the question whether there is a primary growth in these neoplasms, or whether there are independent growths with multiple foci of origin.

TABLE III.—ABRIDGED REPORT OF 106 CASES OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT BY TYPE

Case	Sex, age	Location	Remarks
			Capillary hemangioma, simplex or single
1	M 70	Esophagus	Lesion 2 by 0.5 cm. Increasing dysphagia and weight loss for 5 months. Esophagoscopy, biopsy, and radium implantation. Death in 12 months from hemangioma obstructing esophagus
2	M 50	Stomach	Lesion 11 by 3 by 2.5 cm. Weakness, fullness after meals, and recurrent vomiting, 18 months. Gastrotomy, local excision of hemangioma. No further symptoms, 23 years
3	M 55	Sigmoid, colon	Lesion 1 by 1 by 1 cm. History of ulcerative colitis. No recurrence, 5 years. Proctoscopy: excision of hemangioma, base fulgurated. No further symptoms, 13 years
4	M 67	Cecum	Lesion 1 by 1.3 by 1 cm. Death from hypertension, arteriosclerosis, and hemiplegia. Hemangioma incidental finding at autopsy
5	M 68	Rectum	Lesion 1 by 1.5 by 1 cm. Sensation of pressure in rectum, 10 months. Hemangioma 2 cm. above dentate line excised with clamp and cautery. No recurrence, 9 years
6	F 48	Rectum	Lesion 1 by 0.5 by 1 cm. Fell on picket fence, injured perineum and pararectal area at 6 years of age. Rectal tenesmus developed at 47 years of age. Excision of bluish colored rectal growth. No recurrence, 5 years
			Mixed capillary and cavernous hemangioma
7	M 62	Esophagus, jejunum	Lesion, 1 by 0.5 by 1 cm. Incidental finding at autopsy. Death from complications following transurethral prostatic resection
8	M 67	Stomach	Lesion 6 by 5 by 5 cm., ulceration of mucosa. Pain and sense of fullness in epigastrium, 25 pound weight loss, tarry stools, 6 months. Sleeve resection of stomach. Death 4 years later from chronic nephritis. No recurrence of hemangioma
9	M 68	Stomach	Lesion 4 by 2 by 1 cm. Anorexia and 10 pound weight loss, 6 months. Transgastric exploration, posterior Polya gastric resection. No symptoms or roentgenographic evidence of recurrence, 6 years
10	M 29	Jejunum	Lesion 3.5 by 3.5 by 2 cm. Movable, tender, firm mass palpated in abdomen. Local excision of hemangioma at jejunomesenteric border
11	M 74	Jejunum	Lesion 0.5 to 1.5 cm. Incidental finding at autopsy. Death from myocardial infarction 7 days after suprapubic prostatectomy
12	M 55	Jejunum	Lesion 3 by 2 by 2.5 cm. Three severe gastrointestinal hemorrhages with no other symptoms, 11 years. Roentgenogram of small intestine; tumor observed. Resection. No further hemorrhage, 4 years
13	F 59	Ileum	Lesion 1 by 1 by 1 cm. Adhesive band between cecum and fallopian tube produced obstruction of ileum. Hemangioma found in resected ileum. No further gastrointestinal symptoms, 15 years
14	F 16	Appendix	Lesion 0.3 by 0.3 mm. Recurrent right lower abdominal pain, 4 years. Appendix retrocecal and covered with adhesions. Appendectomy and left oophorectomy. No further symptoms
15	F 50	Rectum	Lesion 3 by 2 by 2 cm. Sensation of pressure and swelling in perineum, 6 years. Excision of hemangioma in rectum and rectovaginal septum. No recurrence, 5 years
16	M 46	Rectum	Lesion 1 by 1 by 0.5 cm. Recurrent pain from hemorrhoids and sensation of obstruction to rectal outlet, 7 years. Hemorrhoidectomy and local excision of polypoid hemangioma. No further rectal complaints, 4 years
			Cavernous hemangioma, multiple phlebectasia type (small cavernous)
17	M 57	Esophagus, small intestine	Incidental finding at autopsy. Death from pneumonia, central nervous system syphilis and hypertension
18	M 60	Esophagus, small intestine, colon	Incidental finding at autopsy. Death from pneumonia, a complication of suprapubic prostatectomy
19	M 69	Esophagus, small intestine	Incidental finding at autopsy. Death from myocardial infarction
20	M 59	Esophagus, stomach, small intestine, colon	Incidental finding at autopsy. Death from streptococcus septicemia secondary to carbuncle of neck
21	M 75	Esophagus, ileum, colon	Incidental finding at autopsy. Death from unresolved lobar pneumonia. Left auricular appendage of heart contained a hemangioma
22	M 77	Esophagus, small intestine	Incidental finding at autopsy. Death from hypertension, coronary sclerosis, and infarction of left ventricle
23	M 75	Duodenum, small intestine	Incidental finding at autopsy. Death 1 month after prostatectomy of a pulmonary embolism
24	M 45	Duodenum, small intestine	Incidental finding at autopsy. Death from syphilitic arthritis
25	M 56	Duodenum, small intestine	Incidental finding at autopsy. Combined abdominoperineal resection for adenocarcinoma of rectum. Death from generalized peritonitis
26	M 60	Duodenum, small intestine	Incidental finding at autopsy. Death from prostatic hypertrophy, pyelonephritis, and uremia

TABLE III.—ABRIDGED REPORT OF 106 CASES OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT BY TYPE—Continued

Cavernous hemangioma, multiple phlebectasia type (small cavernous)

Case	Sex, age	Location	Remarks
27	M 64	Duodenum, small intestine, colon	Incidental finding at autopsy. Death from hypertension and uremia
28	M 74	Duodenum, small intestine	Incidental finding at autopsy. Partial gastrectomy for ulcerating adenocarcinoma. Death from postoperative pneumonia and peritonitis
29	M 71	Duodenum, small intestine	Incidental finding at autopsy. Death from multiple myeloma and lobar pneumonia
30	M 52	Duodenum, small intestine	Incidental finding at autopsy. Death from aortic endocarditis and dilatation of left ventricle
31	M 45	Jejunum	Hematemesis, melena, epigastric pain, 2 years. Posterior gastroenterostomy for duodenal ulcer. Hemangiomas seen during surgical exploration. No further symptoms, 28 years
32	F 68	Small intestine	Incidental finding at autopsy. Death from pulmonary embolism 8 days after radical amputation of left breast for adenocarcinoma
33	M 63	Small intestine	Incidental finding at autopsy. Death from hemorrhage from a duodenal ulcer
34	M 78	Small intestine	Incidental finding at autopsy. Death from carcinoma of prostate and pulmonary metastasis
35	M 60	Small intestine	Incidental finding at autopsy. Partial gastrectomy for adenocarcinoma. Death from duodenal fistula and peritonitis 6 days after operation
36	M 42	Small intestine	Incidental finding at autopsy. Death from genera peritonitis and pneumonia 9 days after cautery excision of gastric ulcer and posterior gastroenterostomy.
37	M 63	Small intestine	Incidental finding at autopsy. Death from generalized arteriosclerosis angina pectoris, and coronary sclerosis
38	M 62	Small intestine	Incidental finding at autopsy. Death from carcinoma of pancreas
39	M 46	Small intestine	Incidental finding at autopsy. Death 7 days after suprapubic cystostomy and insertion of radium needles for carcinoma of bladder. Bronchopneumonia and empyema
40	M 48	Small intestine	Incidental finding at autopsy. Death from pulmonary abscess 3 months after tooth extraction
41	M 69	Small intestine	Incidental finding at autopsy. Death from septicemia and multiple lung abscesses 18 days after suprapubic cystostomy and diathermy for squamous cell epithelioma of bladder
42	M 56	Jejunum, ileum, rectum	Incidental findings at autopsy. Death from bronchopneumonia and empyema
43	M 55	Jejunum, ileum	Incidental findings at autopsy. Death from peritonitis 9 days after resection for obstructive adenocarcinoma in the rectosigmoid
44	M 60	Jejunum, ileum	Incidental finding at autopsy. Death from bilateral pulmonary edema and bronchopneumonia 8 days after right pelviolithotomy. Bilateral staghorn calculi
45	M 65	Small intestine, colon	Incidental finding at autopsy. Death from pernicious anemia and fatty changes in myocardium
46	M 47	Jejunum	Incidental finding at autopsy. Death from local peritonitis 5 weeks after resection for obstructive adenocarcinoma of transverse colon
47	M 64	Small intestine	Incidental finding at autopsy. Death from adenocarcinoma of stomach with metastasis to liver
48	M 70	Small intestine	Incidental finding at autopsy. Death from severe dysphagia and bronchopneumonia after ingestion of "lysol"
49	M 64	Stomach, duodenum, small intestine	Incidental finding at autopsy. Death from coronary occlusion and infarction of left ventricle
50	M 68	Small intestine	Incidental finding at autopsy. Death from adenocarcinoma of rectum and perforation of duodenal ulcer
51	M 66	Small intestine	Incidental findings at autopsy. Death from coronary sclerosis and infarction of left ventricle
52	M 88	Small intestine	Incidental finding at autopsy. Death from cerebrovascular accident 7 days after transurethral prostatic resection
53	M 60	Small intestine	Incidental finding at autopsy. Death from hypertension and cardiac decompensation
54	F 49	Small intestine	Incidental finding at autopsy. Death from metastasis from adenocarcinoma of right breast

TABLE III.—ABRIDGED REPORT OF 106 CASES OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT BY TYPE—Continued

Case	Sex, age	Location	Remarks
Cavernous hemangioma, multiple phlebectasia type (small cavernous)			
55	M 41	Small intestine	Incidental finding at autopsy. Death from tuberculous meningitis
56	F 54	Small intestine	Incidental finding at autopsy. Death from Korsakoff's psychosis and barbiturate poisoning
57	M 64	Ileum	Incidental finding at autopsy. Death from a perforated gastric ulcer and peritonitis
58	M 47	Small intestine, colon, rectum	Incidental finding at autopsy. Death from multiple brain abscesses and acute cerebrospinal meningitis
59	M 69	Jejunum	Incidental finding at autopsy. Death from coronary sclerosis and infarction of the left ventricle
60	M 73	Jejunum	Incidental finding at autopsy. Death from psychosis and multiple infarcts of basal nuclei of midbrain
61	M 62	Jejunum, ileum	Incidental finding at autopsy. Death from chronic asthmatic bronchitis and pulmonary emphysema
62	M 62	Small intestine	Incidental finding at autopsy. Death from myocardial degeneration and pneumonia
63	F 45	Small intestine	Hematemesis and melena with associated syncope, 3 years. Diagnostic procedures did not reveal any lesions in gastrointestinal tract or blood dyscrasia. Abdominal exploration and duodenostomy revealed only hemangiomas. Snake venom given in decreasing amounts for 4 years with no return of hemorrhage
64	M 59	Small intestine	Recurrent tarry stools, 1 year. Cholecystitis and cholelithiasis. No cause for melena observed except vascular tumors. Death from acute yellow atrophy of liver in 4 months
65	M 60	Small intestine	Weight loss and weakness, 10 months. Tarry stools, 10 days. Hemangiomas observed during abdominal exploration and repair of paraesophageal diaphragmatic hernia. No further melena, 2 years
66	M 61	Small intestine	Incidental finding at autopsy. Death from hypertrophic pseudomembranous cystitis and azotemia
67	M 71	Small intestine	Incidental finding at autopsy. Death from cerebral arteriosclerosis and infarction of brain
68	F 39	Small intestine	Recurrent abdominal cramps and blood in stool, 2 weeks. Abdominal exploration during which innumerable small hemangiomas were observed throughout the small intestine. Extensive lesions obviated resection. Evidence of further chronic blood loss, 2 years
69	F 68	Jejunum	Incidental finding at autopsy. Death from pneumonia following amputation of right breast for adenocarcinoma
Cavernous hemangioma, simple polypoid type			
70	M 61	Esophagus	Lesion 2 by 1 by 1 cm. Increasing dysphagia and 15 pound weight loss, 6 months. Esophagoscopy. First biopsy: cavernous hemangioma. Second biopsy: tissue similar to first biopsy as well as adenocarcinoma, grade 2. Radon tube therapy. Death in 6 months
71	M 34	Stomach	Lesion 1.4 by 1.8 by 1 cm. Hematemesis, epigastric tenderness, and vague gastrointestinal distress, 1 year. Partial gastrectomy for tumor prolapsing into duodenum. Excellent health, 7 years
72	F 37	Duodenum	Lesion 4.5 by 4 by 2 cm. Four episodes of nausea, hematemesis, melena, vertigo, and weakness, 7 years. Excision of pyloric sphincter, anterior wall of duodenum and hemangioma. No gastrointestinal symptoms, 17 years
73	F 75	Duodenum	Lesion 0.5 by 0.7 cm. Incidental finding at autopsy. Death from cerebrovascular accident
74	M 71	Ileum	Lesion 0.5 by 0.5 cm. Incidental finding at autopsy. Death from chronic lymphatic leucemia
75	M 56	Jejunum	Lesion 1 by 1 by 1 cm. Incidental finding at autopsy. Death from hypertension arteriosclerosis, hypertrophy of prostate, and uremia
76	M 74	Jejunum	Lesion 1 by 1 by 1 cm. Incidental finding at autopsy. Death from empyema 15 days after partial duodenectomy for bleeding duodenal ulcer
77	M 34	Ileum	Lesion 1 by 2 by 1 cm. Incidental finding during operation for removal of granulomatous ulcer of cecum
78	M 54	Jejunum	Lesion 1 by 1 by 1.5 cm. Incidental finding at autopsy. Death from peritonitis 10 days after resection for obstructive adenocarcinoma of the transverse colon
79	F 39	Jejunum	Lesion 0.4 by 0.5 cm. Incidental finding at autopsy. Death from cardiac decompensation
80	F 68	Jejunum	Lesion 0.8 by 1 cm. Incidental finding at autopsy. Death from primary carcinoma of the gall bladder.

TABLE III.—ABRIDGED REPORT OF 106 CASES OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT BY TYPE—Continued

Case	Sex, age	Location	Remarks
			Cavernous hemangioma, simple polypoid type
81	M 63	Ileum	Lesion 1 by 1.5 cm. Incidental finding at autopsy. Death from hypernephroma of left kidney
82	F 50	Appendix	Lesion 6 by 6 mm. Incidental finding in appendix which was removed at same time as cholecystectomy for gangrenous cholecystitis
83	F 83	Sigmoid	Lesion 1 by 1 cm. Incidental finding at autopsy. Death from senile psychosis
84	M 26	Sigmoid	Lesion 1.5 by 1.5 cm. Extensive cavernous hemangioma of penis, scrotum, and perianal margin since birth. Local radium applications, 2 years of age. Two severe rectal hemorrhages at 10 years of age; a bleeding tumor was allegedly removed from rectum. Return of bright red blood on surface of each stool, 6 months. Weakness and anemia with no pain or cramps. Transcolonic excision of hemangioma; a third hemangioma palpated in right lobe of liver. No further bleeding, 2 years
			Cavernous hemangioma, diffuse expansive type (single contiguous)
85	F 29	Jejunum	Lesion 7 by 7 by 3 cm. Recurrent symptoms and signs of subacute intestinal obstruction together with abdominal mass, 2 years. Resection of 25 cm. of jejunum and contiguous hemangioma. No further symptoms, 4 years
86	M 33	Entire small intestine, colon, rectum	Recurrent severe intestinal hemorrhages requiring 25 blood transfusions, 9 years. Partial gastrectomy done elsewhere with return of hemorrhage. Ileotransverse colostomy, resection of 3 feet of ileum and right colon done elsewhere with return of hemorrhage. Abdominal exploration revealed entire small and large intestine covered with cavernous hemangioma. Patient could not have survived extensive resection necessary to remove hemangioma. Recurrent hemorrhages, 3 years
87	F 47	Cecum, appendix	A diffuse cavernous hemangioma which involved the entire cecum and appendix was observed during cholecystectomy for cholecystitis and cholelithiasis. No gastrointestinal bleeding in 18 year interval since operation
88	F 7	Sigmoid, rectum, bladder	Recurrent hemorrhage from rectum and bladder beginning at 6 months after birth. Death from severe rectal hemorrhage in spite of local packing and supportive therapy
89	F 48	Colon	Lesion 4 by 5 by 4 cm. Recurrent abdominal cramps, increasing constipation, persistent tender mass in left lower quadrant, 6 years. Blood coating surface of stool, 4 months. Cecostomy followed by first and second stage Mikulicz resection. Living and well 1 year after operation
			Cavernous hemangioma, multiple diffuse type (noncontiguous)
90	M 28	Sigmoid, rectum, kidney	Constipation since birth. Alternating constipation and diarrhea, pain in rectum, blood in stools, 10 years of age. Three episodes of gross hematuria. Roentgen therapy on basis of possible lymphoid hyperplasia. Returned 11 years later with extreme weakness, pallor and anemia from severe rectal hemorrhages. Transfusions. Radium pack. Shock and death from hemorrhage
91	F 23	Sigmoid, rectum, bladder, labia, leg	Recurrent hematuria, rectal hemorrhages and swelling of left leg since infancy. Suprapubic exploration and coagulation of bleeding points during episodes of severe hematuria. Rectum, sigmoid, and bladder extensively involved with cavernous hemangioma. Rectal and urinary hemorrhages continued for 3 years
92	M 53	Colon, liver	Lesion 4 by 2 cm. Incidental finding at autopsy. Death from metastatic adenocarcinoma from the rectum 2 years after combined abdominoperineal resection
			Hemangioendothelioma
93	F 76	Esophagus, lower third	Grade 2 lesion[1] 2 by 1 by 2 cm. Fullness in throat and esophagus without dysphagia or hoarseness, 7 years. Progressive dysphagia and chest pain, 6 weeks. Esophagoscopy. Biopsy and dilatation with No. 41 F. bougie. Minimal roentgen therapy through two portals. Death in 11 months
94	M 43	Stomach	Grade 1 lesion[1] 4.5 by 4 by 3 cm. Epigastric pain and soreness relieved by alkalies, 8 years. Knife excision of ulcer crater and posterior gastroenterostomy. Free of symptoms, 5 years. Returned with dyspnea on exertion, weakness and secondary anemia, 3 years. "V" resection of lesser curvature and tumor. Death 7 years later from cerebrovascular accident. No recurrence of tumor
95	F 25	Stomach	Grade 1 lesion[1] 2 by 2 by 2 cm. Indigestion for 4 years. Free of symptoms, 1 year. Constant midepigastric soreness not relieved by food or alkalies, 1 year. Severe hematemesis, melena, and 20 pound loss of weight, 4 months. Gastrotomy with knife excision of tumor and surrounding gastric mucosa. No further gastrointestinal symptoms, 20 years
96	M 59	Stomach	Grade 1 lesion[1] 4 by 3 by 2 cm. Weakness, weight loss, and tarry stools, 1 year. Free of symptoms, 9 years. Return of tarry stools and midepigastric pain, 4 months. Knife excision of tumor and posterior gastroenterostomy. No further gastrointestinal symptoms, 22 years
97	F 31	Stomach	Grade 1 lesion[1] 4 by 3 by 3 cm. Weakness, tarry stools, and anemia, 1 month. Free of symptoms for 3 years. Recurrent episodes of melena, 2 months. Freely movable tender epigastric mass. Gastric resection (posterior Polya). Excellent health, 22 years after operation
98	M 55	Stomach	Grade 3 lesion[1] 7 by 6 by 6 cm. Severe hematemesis and melena, 3 months. Gastric resection (posterior Polya). Postoperative roentgen therapy. Death from metastasis, 8 years after operation
99	M 21	Stomach	Grade 1 lesion[1] 7.5 by 6 cm. Tarry stools, 1 month. No symptoms for 1 year. Return of tarry stools and epigastric pain, 1 week. Abdominal exploration and biopsy done elsewhere. Patient refused further operation. Advised to have roentgen therapy at home. Could not be located 2 years later

[1]Broders' classification.

TABLE III.—ABRIDGED REPORT OF 106 CASES OF VASCULAR LESIONS OF THE GASTROINTESTINAL TRACT BY TYPE—Concluded

Hemangioendothelioma

Case	Sex, age	Location	Remarks
100	M 50	Stomach	Grade 1 lesion[1] 9.5 by 9 by 4 cm. Freely movable abdominal mass, 6 months. Tumor detached from posterior wall of pyloric antrum. Postoperative roentgen therapy. No evidence of recurrence 4 years after operation
101	F 22	Duodenum	Grade 1 lesion[1] 5.5 by 3 by 2 cm. Vomiting with any dietary indiscretion, 2 years. Cramplike abdominal pain. Transduodenal excision of tumor. No evidence of recurrence, 4 years after operation
102	M 59	Terminal ileum, mesentery	Grade 3 lesion[1] 14 by 12 by 3 cm. Recurrent lower abdominal pains, dark stools and 25 pound weight loss, 3 months. Tender mass in right lower part of abdomen. Two-stage ileotransverse colostomy and resection of right part of colon. Massive doses of postoperative roentgen rays. Death from metastasis, 14 months after operation
103	M 32	Ileum	Grade 1 lesion.[1] Appendectomy and ileocolostomy done elsewhere for "ileitis." Return of abdominal pain and ascites in 3 months. Abdominal exploration and biopsy of nodular implants, distal ileum, and peritoneum. Many atypical endothelial cells aspirated from hydrothorax. Extensive roentgen therapy to chest and abdomen. Returned 3 years later with no evidence of abdominal mass, ascites, or hydrothorax
104	M 51	Appendix	Grade 1 lesion[1] 8 by 8 by 6 mm. Recurrent upper abdominal pain, dark stools, weakness, 6 months. Abdominal exploration demonstrated no cause for intestinal bleeding. Small diaphragmatic hernia. Appendectomy. Death at home during tonsillectomy, 2 years after abdominal operation
105	F 69	Rectum	Grade 1 lesion[1] 1 by 1 by 2 cm. Rectal tenesmus. Sigmoidoscopic examination did not reveal any lesion. Six years later patient complained of painless nodule which prolapsed through anus. Nodule excised, anus dilated, quinine and urea injected into small internal hemorrhoids. Three hundred and thirty milligram hours of radium applied to healing wound. No return of tumor 13 years after operation
106	F 57	Rectum	Grade 3 lesion[1] 5 by 4 by 3 cm. Bleeding with defecation, rectal tenesmus, ribbonlike stools, pain across sacrum, weight loss, persistent cough, 6 weeks. Examination revealed encapsulated interlobar fluid, adenomatous goiter with hyperthyroidism and an infiltrating lesion in the lower third of the rectum. Biopsy. Local radium applied to tumors, roentgen therapy to chest. Patient failed rapidly, 3 months. Death

[1]Broders' classification

Robinson and Castleman, in 1936, stated that there were only 4 apparently authentic cases of this condition which had been reported, respectively, by Borrmann in 1907, Shennan in 1914, Ewing in 1919, and by Geschickter and Keasbey in 1935. Robinson and Castleman added 1 similar case of their own and separated the cases of Wright, Hall, and others into a group they called "metastasizing hemangiosarcomas." They also called another group "malignant," which was characterized by occurrence in children, a local invasive tendency, hemorrhage, and death.

Borrmann, in discussing his case, expressed the opinion that the presence of metastasis could no more be used to determine definitely the benign or malignant character of the process than could, for example, the absence of a capsule, rapid growth, or invasiveness, which are not exclusively benign or malignant properties. Shennan wondered whether the histologic, rather than the clinical, criteria were not at fault. Ewing considered the "benign metastasizing" angioma a borderline entity and described it as possessing certain peculiar features of malignancy. Jaffe expressed the thought that, because of their infiltrative growth and stroma of undifferentiated mesenchyme, these lesions cannot be considered histologically benign. Stout, in 1943, reviewed all the reports on cases of "benign metastasizing hemangioma" and included the report of a detailed examination of Robinson and Castleman's slides. His final conclusion was that they all show atypical endothelial and very free vascular anastomosis which definitely bring them into the class of hemangioendothelioma.

In only 4 cases of "benign metastasizing hemangioma" in the literature was involvement of the gastrointestinal tract proved by biopsy. A summary of the data in these cases is given in Table II. These 4 vascular tumors involving the gastrointestinal tract might well be classified as hemangioendotheliomas if we could review the histopathologic details and include modern concepts of metaplasia, atypical mitotic figures, and evidence of invasion. On the other hand, one cannot help but feel that the existence of multiple primary benign hemangiomas rather than a metastasizing process could explain the origin and distribution of these lesions.

Kaposi's sarcoma. In 1872 an Austrian dermatologist, Kaposi, described the lesions now generally called "Kaposi's sarcoma." He named it "idiopathic multiple pigmented sarcoma." In 1894 he changed the designation to "sarcoma idiopathic multiplex hemorrhagicum."

The early pathologists were uncertain as to whether this was an inflammatory or a neoplastic process. Some still believe that the tumor is implanted on an inflammatory base, whereas most authors now feel that the process is a neoplasm of low grade malignancy.

More recent authors (48, 49, 66, 236) have attempted to reclassify the disease according to their theories as to its cell origin. Since the tumor contains blood vascular elements or cavernous blood-filled spaces, and since many pathologists consider certain of its histopathologic features to be identical with those designated as "hemangioendothelioma," it will be considered in the same general group with other malignant vascular lesions which are found to involve the gastrointestinal tract.

The disease has a tendency to develop first on the extremities as a unilateral lesion, to become bilaterally symmetrical, and then to progress to a generalized condition involving most often the gastrointestinal tract. It appears to be especially prevalent in men of Italian or Galician birth but, as Doerffels pointed out, there appears to be a geographic rather than a racial distribution since the vast majority of cases originate in Russia, Poland, and Northern Italy.

Histopathology. The histopathology of this lesion has been variously interpreted as being that of a sarcoma arising in angiomas of the skin, proliferation of the interstitial connective tissue and endothelium, a disturbance of the "monocytogenic" function of the reticuloendothelial system, hemangioendothelioma and malignant proliferation of the perthelial cells, and, recently, several cases of leucocytic dyscrasia have been mentioned in connection with this disease. Various histopathologic features may be observed in different lesions of the same individual and this may account for many of the varied histogenic interpretations.

Any cell-type classification must explain how vascular channels predominate in some areas, fibrous tissues in others, and endothelial hyperplasia in most microscopic fields.

Choisser and Ramsey (49), in 1940, circumvented the problem of multicellularity by suggesting that all of the various types might arise from the reticuloendothelial system.

The cellular arrangement of the older lesions resembles that of a low grade hemangioendothelioma, and many pathologists consider this tumor as an unusual representative of this group. The apparent male sex-linked character of this lesion is, however, different from that of the general group of hemangioendotheliomas, in which the incidence is about the same in both males and females. In this connection it is interesting to note that in 365 cases of Kaposi's sarcoma reviewed by Doerffel, all but 21 patients were males.

The most striking feature exemplified by the pathologic anatomy of Kaposi's sarcoma is that the same changes occur in the viscera as in the skin; this fact, together with simultaneous involvement, points to the possibility that the internal lesions are independent in origin and not truly metastatic. Paolini reported a case in which clinical symptoms appeared in the gastrointestinal tract before lesions could be found in the skin.

Incidence and distribution. Becker and Thatcher, in 1938, found reports of 440 cases in the literature. Twenty-six cases of Kaposi's sarcoma have been proved by clinical history and biopsy of skin lesions at the Mayo Clinic. Four of the patients had vague gastrointestinal symptoms and 2 others had previously had gastric resections before coming to the clinic. In only 1 case was a record of gastrointestinal bleeding noted in the history.

Fourteen cases in which specific mention was made of the presence of Kaposi's lesions in the gastrointestinal tract at autopsy have been reported in the literature.

The complete gastrointestinal tract is involved in many of the cases.

Symptoms, treatment, and prognosis. A review of the gastrointestinal symptoms produced by these lesions in the 14 cases referred to in a preceding sentence reveals that 9 reports made no mention of intestinal symptoms; however, 1 patient had severe hematemesis, 2 patients had tarry stools, 2 mentioned gastrointestinal disturbances, including nausea and vomiting, while 1 patient had no known intestinal disturbance during life.

Two commonly accepted forms of treatment are, first, roentgen therapy and, second, administration of a solution of potassium arsenate (U.S.P.) by mouth, or of sodium arsenate by injection. Neither of these methods of therapy has prevented a fatal termination of the disease.

Angiosarcoma. The sarcomas may be defined as malignant tumors composed of cells of the connective tissue type. A more descriptive term such as "angiosarcoma" indicates the dominant histopathologic pattern of the individual tumor.

The prominent role played by the endothelial cells in all types of sarcoma is demonstrated by the formation of new blood vessels in the connective tissue stroma of the tumor; this is in contrast to the invasion of pre-existing blood vessels by carcinomas.

Histogenesis and histopathology. The angiosarcomas have a tendency to form many functioning blood channels which are imperfect and immature as compared to the normal vascular substrate of adult organs or tissue. When these spaces become obliterated by proliferating, edematous, atypical endothelial cells, growth ceases

and necrosis or various types of degeneration may be seen.

Many writers feel that the term "angiosarcoma" should be reserved for those very vascular tumors in which formed blood vessels, rather than atypical, extremely hyperplastic endothelial-lined blood spaces, are observed.

The etiology of angiosarcoma, as with all forms of malignant lesions, is obscure.

Incidence and distribution. Data on 6 cases of angiosarcoma of the gastrointestinal tract were found in this review. Three lesions were thought to have originated in the stomach, while the others were considered as metastatic deposits from other parts of the body.

Freilich and Coe, in 1936, reviewed the reports of 20 cases in the literature over the period from 1918 to 1934, inclusive, and found only 1 case in which they felt that the lesion was primary in the gastrointestinal tract. The lesion in this case allegedly appeared in the jejunum.

Symptomatology, treatment, and prognosis. The most prominent symptom of this group of lesions was pain. This occurred first at the site of origin and later at the sites of metastatic lesions.

There have been a few cases cited in the literature in which exploration of the abdominal organs was carried out early enough to permit resection of a primary angiosarcoma before obvious metastasis had occurred.

Roentgen therapy has been of little or no value, and 3 of the 4 patients reported on in detail in the last-named study survived only a few months after the onset of symptoms.

EXPERIMENTAL PRODUCTION OF MALIGNANT VASCULAR TUMORS

In recent years several different carcinogens have been identified and are used in the experimental production of malignant tumors. Selbie, in 1938, found that radioactive thorotrast injected subcutaneously acts as a foreign body and the resulting constant bombardment of alpha particles stimulates a continuous proliferation of connective tissue. If capillary endothelial cells are involved, a hemangioendothelioma will develop. This was found to occur, not only at the site of injection, but also in parts of the body distant from the point of initial irritation.

An interesting report was published by White and Stewart, in 1942, indicating that when certain strains of white mice were fed methylcholanthrene there developed precancerous epithelial lesions, adenocarcinomas of the intestine which metastasized to the mesenteric lymph nodes and liver, and hemangioendotheliomas which involved singly or in combination the intestine, mesentery, and pancreas, and which, in turn, then metastasized to the liver and lungs. A higher incidence of hemangioendothelioma developed in one strain of mice than in others.

Andervont, Grady, and Edwards, in 1942, injected 2-amino-5-azotoluene into the subcutaneous tissue of 63 mice. Subsequently, 71 hemangioendotheliomas were found in these mice and most of the lesions were within fat deposits in the interscapular region, abdomen, or subcutaneous tissues away from the site of injection. These authors stated that the etiology of this predilection for fatty tissue is obscure. Transplants were also successful, 1 tumor being carried for 20 generations. Other investigators have reported induction of hemangioendotheliomas at or near the site of administration of polycyclic hydrocarbons and colloidal thorium dioxide.

TREATMENT OF VASCULAR TUMORS

In contrast to the numerous and highly effective methods of treating vascular malformations and tumors of the skin and the mucous membrane of the mouth, tongue, and nasopharynx, the vascular lesions involving the lower part of the gastrointestinal tract are, by virtue of their position, difficult and often impossible to eradicate.

Surface applications of sclerosing agents are not practical for many deep-seated vascular tumors; however, refrigeration with carbon dioxide snow or the injection of sodium morrhuate has a limited application in the treatment of esophageal or rectal hemangiomas.

Plication of intraperitoneal vascular tumors with mattress sutures or ligation of their tributary vessels may be followed by progressive necrosis and rupture of the associated hollow viscus. The insertion of hot platinum needles or cautery fulguration has been utilized in a few cases in which danger from future necrosis of vital structures was not an important consideration.

Radium and roentgen therapy have proved valuable in the treatment of many vascular lesions both on the body surface and in the gastrointestinal tract. The effective roentgen and radium emanations produce swelling and degeneration of the endothelial cells.

Pack and Livingston have correlated the histopathologic features of vascular lesions with the amenability of the lesions to roentgen therapy. They stated that the capillary angiomas of the skin seem radiosensitive, that the bulky cavernous hemangiomas in children tend to be radiosensitive, although there are better forms of treatment, and that the bulky cavernous hemangiomas of

adults are radioresistant except to caustic sclerosing doses.

Bailey and Kiskadden, on the other hand, found that the well differentiated endothelial cells of capillary hemangiomas are resistant to roentgen therapy.

It has been pointed out by MacKee that beta rays are more efficacious than gamma rays for superficial lesions; however, gamma radiations have given better results than filtered roentgen rays for deeper lesions.

Baensch, in 1938, treated cavernous hemangiomas of the body surface by the implantation of radium needles filtered through platinum and iridium. Excellent results were observed in 203 cases, with no bleeding or necrosis of the hemangiomas.

The mere fact that good results are reported by numerous authors using many methods and types of radiation therapy serves to prove that no single approach is applicable and successful in all cases.

The vascular lesions present special problems in radiation and surgical therapy which depend on the type of tumor and specific location in the gastrointestinal tract. These problems will be considered in the following section of this review.

ANALYSIS OF CASES

Vascular malformations and tumors of the gastrointestinal tract. Because of the confusion of nomenclature in the literature, it is difficult to state the exact incidence of any individual types of either benign or malignant tumors of the gastrointestinal tract.

Geschickter, in 1935, reviewed the reports of a large series of tumors appearing in these organs and found reference to 962 malignant tumors during the same period that he collected reports of 178 benign tumors. Six of the 178 benign tumors were angiomas, which accounted for approximately 3 per cent of the benign lesions.

Ackerman, in 1937, found only 3 cases of hemangiomas of the gastrointestinal tract during a 10 year period in which 1,200 autopsies were performed.

Geschickter and Keasbey reviewed the data on 570 tumors of the blood vessels found in the surgical and autopsy records of the Johns Hopkins Hospital. They found in this group only 10 vascular lesions which involved either the kidney, spleen, intestines, or mesentery.

Kaijser, in 1936, collected, from the literature, reports of 74 vascular tumors found in the gastrointestinal tract, and classified the tumors.

Data on 344 benign and malignant vascular tumors involving the gastrointestinal tract were collected in our review. Two hundred and eighty-three of these lesions were classified as benign while the other 61 were considered malignant; thus, approximately 82 per cent of the lesions were benign. One hundred and ten of the 344 cases were encountered in the surgical or autopsy records of the Mayo Clinic; these 110 cases occurred among more than 1,400,000 persons. It can thus be estimated that roughly 1 in every 14,000 persons registered at the Mayo Clinic was found to have a benign or malignant vascular tumor involving the gastrointestinal tract.

Symptoms. In 66 per cent of all the cases of benign vascular tumor, symptoms were mentioned, whereas in all of the cases of malignant tumors symptoms were recorded.

Treatment. Thirty per cent of the patients with benign vascular tumors underwent surgical treatment, while 31 per cent of the patients with a malignant tumor of the gastrointestinal tract underwent some type of surgical exploration and treatment. Sixteen per cent of the malignant vascular tumors and 5 per cent of the benign vascular tumors were treated by other methods than operation.

Complications. Twelve per cent of the patients with benign vascular lesions and 48 per cent of those with malignant vascular lesions were mentioned as having died from some complication of the gastrointestinal tumor. Thirty-four per cent of the benign vascular tumors, as opposed to none of the malignant vascular tumors, were mentioned as incidental findings during autopsy.

Sex ratio. Watson and McCarthy, in their extensive series reported in 1940, cited a definite trend to indicate that benign blood and lymph vessel tumors occur more frequently in females. In their series, 65 per cent of the lesions occurred in females, and this frequency of occurrence was mentioned as a constant feature in the literature. The sex ratio was calculated, however, on the basis of all lesions, including those which appeared on the surface of the body as well as those in the viscera.

Our review of the lesions appearing in the gastrointestinal tract, on the other hand, revealed a sex ratio of 1 female to 2 males among cases reported in the literature and a slightly higher ratio of approximately 1 female to 3 males in the Mayo Clinic series.

Vascular malformations and vascular tumors of the esophagus. Benign tumors of the esophagus are comparatively rare and the majority are amenable to some form of treatment. Malignant tumors, by contrast, are relatively common and very difficult to treat. The vascular lesions of the

Fig. 1. Cavernous hemangioma of the esophagus, multiple phlebectasia type. Note large vascular spaces lined by a single layer of endothelial cells (hematoxylin and eosin ×24).

esophagus constitute a small minority of the aforementioned groups. Esophageal varices are not considered as primary vascular malformations and have not been included in this review.

Incidence. Sommer, in 1896, and Bennecke, in 1906, reported the first cases of multiple cavernous hemangiomas of the esophagus.

Vinson and his co-authors reported, in 1926, on the findings and treatment in a case of capillary hemangioma which was treated through the esophagoscope with a radium tube.

A summary of the data on the reported cases of vascular tumors of the esophagus, presented in Table II, is based on the following lesions: 9 benign hemangiomas, 2 hemangioendotheliomas and 1 Kaposi's sarcoma.

One malignant and 9 benign vascular lesions were found also in the Mayo Clinic series and include the following: 1 mixed capillary and cavernous hemangioma, 6 multiple cavernous hemangiomas (Fig. 1), 1 simple polypoid cavernous hemangioma, and 1 hemangioendothelioma.

Symptoms. The symptoms from vascular tumors of the esophagus include slowly progressive dysphagia, regurgitation of food, pain in the thorax extending to the back and accentuated on swallowing, slow starvation, dyspnea if the tumor enlarges to obstruct the trachea, severe pain and subcutaneous emphysema following perforation, and, rarely, severe hematemesis and melena.

Among the benign vascular lesions found in this study, 1 tumor perforated the esophagus with resulting mediastinitis and death, 7 tumors were incidental findings at autopsy, and 1 tumor was associated with a carcinoma of the esophagus, which was perforated and caused death, and the hemangioendothelioma produced severe dysphagia, with complete esophageal obstruction and death.

Differential diagnosis. The lesions to be considered in the differential diagnosis of vascular neoplasms are the various types of malignant and benign tumors, esophageal varices, cardiospasm, and other demonstrable causes for dysphagia. Telangiectatic lesions are difficult or impossible of recognition, even when a bleeding point is observed, under direct vision with the esophagoscope.

Criteria for the roentgenologic diagnosis of benign and malignant esophageal tumors have been carefully defined; however, accurate histopathologic diagnosis can, in the final analysis, be made only by esophagoscopy and biopsy.

Treatment. The three methods of treatment for vascular lesions of the esophagus include transthoracic surgical extirpation, roentgen therapy through numerous portals, and those procedures adapted for use with the esophagoscope. The method of choice depends on the particular location and type of the lesion.

Surgical extirpation may be carried out through a posterolateral, an upper posteromediastinal, or a transthoracic approach, depending on the location of the tumor. Polypoid tumors with a small pedicle may be excised, the esophageal continuity being maintained. Lesions occurring in the lower third of the esophagus may be resected in the manner now utilized for carcinomas involving the esophagogastric junction. Extensive malignant lesions involving the upper third of the esophagus might be considered for esophageal resection followed by the establishment of a cervicoesophageal fistula, the performance of a Beck-Jeanu gastrostomy, and, later, reapproximation of the esophagus and stomach through thoracic skin tube grafts. Local invasion and early metastasis along with all attendant hazards of multiple operations and the expense involved in long periods of hospitalization obviate the use of the last-mentioned operative procedure.

Roentgen therapy should be utilized only if treatment through the esophagoscope or thoracic surgical treatment is impractical. In no reported cases were the patients treated by this method alone.

Malignant change is rarely encountered in pedunculated lesions and several of these tumors have been removed through the esophagoscope. Radium packing, adjacent to a hemangioma, has

been reported by Vinson and his co-authors and may be considered in the treatment of very extensive benign vascular lesions; however, its attendant hazards, esophageal perforation or severe hemorrhage, must be remembered.

Moersch, in 1940, reported the injection of esophageal varices with sodium morrhuate. This procedure may be applicable to hemangiomas when encountered in the future.

The series of esophageal vascular malformations and tumors reported in this study is too small for any generalizations as to prognosis; however, all 3 patients with symptoms produced by esophageal tumor were dead within 1 year.

Vascular malformations and vascular tumors of the stomach. Vascular malformations and vascular tumors are rarely encountered in the stomach; however, their importance is emphasized by a high incidence of severe complications, the frequent occurrence of malignant change, and the satisfactory prognosis after adequate removal.

Incidence of benign vascular tumors. Rokitansky (209), in 1855, alluded to the first gastric hemangioma by stating that "erectile tumors" may be attached by a broad base; however, Lammers, in 1893, gave the first detailed description of a capillary hemangioma found at autopsy.

In 1920 Lemon collected the reports of the first 5 gastric hemangiomas to appear in the literature and added 1 case of his own.

Since this first series of collected cases, numerous reports have appeared in the literature. These are summarized in Table II.

The reported incidence of hemangiomas as compared to other benign gastric tumors has been listed as between 1.6 and 14.7 per cent. This discrepancy depends largely on whether material has been collected from surgical or autopsy records.

The reports of the vascular malformations and benign vascular tumors of the stomach collected from the literature for our review include the following: 11 cases of multiple telangiectasis, 3 of capillary hemangioma, 1 case of mixed capillary and cavernous hemangioma, 4 cases of multiple phlebectasia, 1 case of diffuse expansive cavernous hemangioma, 2 cases of multiple diffuse expansive cavernous hemangioma, and 5 of unclassified hemangiomas. This makes a total of 27 benign vascular lesions.

Four benign vascular tumors of the stomach were found in the Mayo Clinic series. They were classified as follows: 1 capillary hemangioma (Fig. 2), 1 mixed capillary and cavernous hemangioma, and 2 polypoid cavernous hemangiomas.

Incidence of malignant vascular tumors. Malignant lesions derived from the connective tissue and supporting structures such as the blood vessels are rarely encountered in the stomach.

Fig. 2. Capillary hemangioma of the stomach, 11 by 3 by 2.5 cm. Note ulceration of the mucosa at the distal end (top) of the tumor.

Dahlgren, in 1934, reviewed the reports of 11 previously described endotheliomas in the literature and added 1 case of his own. He mentioned the following histopathologic classification of these lesions; endothelioma, with no further descriptive terms, 6 cases; lymphangioendothelioma, 3 cases; hemangioendothelioma, 1 case; and perithelioma or capillary hemangioendothelioma, 1 case. In 1 case no microscopic details were given.

Lemon and Broders, in 1942, stated that sarcomas have been estimated variously to comprise from 1 to 8 per cent of all neoplasms of the stomach. They published a review of 14 cases which included leiomyosarcomas, fibrosarcomas, and 2 hemangioendotheliomas. They postulated that this low ratio of 2 hemangioendotheliomas seemed reasonable because of the abundance of smooth muscle in the stomach as compared with the amount of vascular endothelial tissue.

Data on the malignant vascular lesions of the stomach which were reported in the literature are summarized in Table II. These lesions included 3 hemangioendotheliomas, 12 endotheliomas, and 8 Kaposi sarcomas. Records of 7 cases of hemangioendothelioma (Fig. 3) of the stomach were

found in the Mayo Clinic series. The clinical details are given in Table 3.

Symptoms. There are no characteristic digestive symptoms which may be attributed to benign tumors in the stomach. Minnes and Geschickter stated that in their series of 50 cases, 36 patients gave no indication of the presence of a lesion.

In our collected review of 33 cases of benign vascular tumors of the stomach, we found that symptoms developed in 24 cases as follows: vague gastric distress in 2 cases, pain in 2, weight loss in 2, hematemesis in 4, melena in 12, fatigue in 2, vomiting in 1 case, and death followed severe gastric hemorrhage in 4 cases.

Bleeding from these hemangiomas may be of two types: the patient may have a severe hemorrhage with hematemesis and melena, or the blood may be lost by minimal persistent oozing, with associated signs of secondary anemia.

The hemangiomas often project into the gastric lumen and tend to develop a pedicle as a result of peristaltic activity. This occurred in 3 of the 4 cases reported in the Mayo Clinic series. Pyloric obstruction from a ball-valve action of the tumor may cause pain, nausea, and severe vomiting.

Symptoms of malignant vascular tumors. The symptoms produced by the malignant vascular lesions included pain in 8 cases, hematemesis in 5, weight loss and marked weakness in 2, melena in 7, and vomiting in 1 case. A palpable mid-epigastric mass was noted in 2 cases.

Patients with malignant vascular lesions of the stomach often give a history of vague epigastric distress for many years followed by a long period without complaints. A return of progressive severe symptoms brings them to a physician for diagnosis. This historical sequence occurred in 4 of the 7 patients in the Mayo Clinic series.

Differential diagnosis. The development of the flexible gastroscope and the establishment of more accurate roentgenologic criteria have made the differential diagnosis between benign and malignant lesions more accurate; however, all tumors appearing in the stomach must still be considered malignant till proved benign by examination under the microscope. This requires biopsy or complete surgical extirpation.

The gastroscopic appearance of multiple telangiectatic lesions was first described by Renshaw in 1939. Pigmented spots and chronic localized gastric purpuric lesions must be considered in the differential diagnosis.

Treatment. The treatment of all vascular malformations and vascular tumors, when possible, should be complete surgical extirpation. When one is confronted with a specific gross vascular lesion of the stomach, the chances are against that lesion's being or remaining benign and, even though some method for adequate biopsy might be developed, the risk of the complications of ulceration, bleeding, and later malignant change would still outweigh the risk of surgical treatment in all but the most extensive lesions.

The type of resection indicated depends on the position and extensiveness of the lesion and on the operative risk for the individual patient.

Judd and Hoerner, in 1936, summarized their indications for removal of benign tumors as follows: (1) small, single, symptomless lesions high on the cardia are inaccessible and local excision may be advantageous; (2) gastrojejunostomy must be considered in all cases of local excision to overcome any tendency toward gastric retention secondary to interference with gastric motility; (3) a Billroth I type of resection may be utilized in lesions near the pylorus; (4) Billroth II and Polya operations are best considered for treatment of large tumors; and (5) multiple lesions require radical resection.

The polypoid tumors of the stomach are all potentially malignant, and with the decrease in mortality following wide and extensive gastric resections during the past decade, together with minimal postoperative gastric symptoms, the risk of possible malignant changes in the pedicle and surrounding tissue far outweigh the risk of radical resection except in the few cases in which a potentially high morbidity or mortality rate prevails with any type of abdominal exploration.

Abdominal exploration and gastric resection is the treatment of choice for all malignant vascular lesions regardless of the histopathologic structure. Many lesions are found to have a sharp line of demarcation from other viscera and, in spite of size, many have been resected with excellent results. A summary of the clinical findings, methods of treatment, and the results is given in Tables I, II, and III.

Local application of radium is impossible in the stomach and radon needles would be a very poor substitute for radical surgical treatment. Roentgen rays may be used in the treatment of very extensive cavernous hemangiomas which involve many intra-abdominal structures and cannot be resected. Several cases of this type are mentioned in the literature but follow-up studies are inadequate.

Prognosis. Osler (183), Boston, Watson and McCarthy, and Stellar have all cited cases of gastric telangiectasia in which death resulted from hemorrhage; however, many patients with this type of lesion continue with intermittent

Fig. 3. Hemangioendothelioma, grade 1, of the stomach, with imperfect formation of sinuses or capillaries. There is moderate variation in the size and shape of fusiform endothelial cells, with elongated nuclei and rare mitotic figures (hematoxylin and eosin ×173).

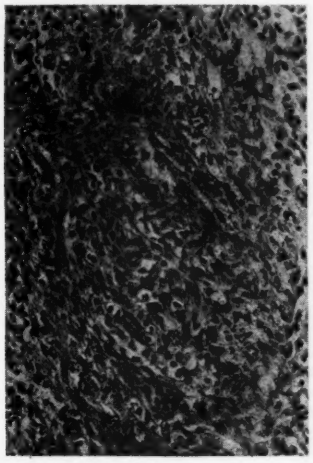

Fig. 4. Hemangioendothelioma, grade 1, of the duodenum. Note moderate anaplasia of fusiform and oval-shaped endothelial cells, arranged in masses around imperfect capillaries or forming papillary projections in larger cavernous spaces (hematoxylin and eosin ×173).

gastric hemorrhages throughout life and die of other unrelated conditions.

Many factors influence the prognosis for patients with vascular lesions in the stomach. These include the general surgical risk with regard to the particular patient; the type, extensiveness, and metastatic spread of the lesion; and the surgical complications associated with and following removal of vascular tumors. A summary of the data in these cases is presented in Tables II and III.

A large majority of the patients with benign lesions had no further symptoms after surgical extirpation of the vascular tumor. Of 7 patients with hemangioendotheliomas of the stomach observed in the Mayo Clinic series, 3 were living and well 20 years after surgical treatment, 2 were living 7 and 4 years, respectively, after surgical treatment, 1 patient, with a high grade hemangioendothelioma, died of extensive recurrence from the original lesion 8 years after operation and roentgen therapy, and 1 could not be traced.

Vascular malformations and vascular tumors of the duodenum. Although benign tumors of the duodenum are extremely rare, their incidence is only slightly lower than that for primary malignant growths occurring in the same segment of the gastrointestinal tract.

Laboulbéne, in 1872, reported the death of a patient following severe hemorrhage from an almond-sized duodenal tumor which contained both capillary and cavernous blood-filled spaces. Since the time of this early case report only 6 other benign vascular tumors have been mentioned in the literature. Five of these were cavernous hemangiomas, while no histopathologic details were presented of the sixth one.

Two simple polypoid cavernous hemangiomas and 8 hemangiomas of the multiple phlebectasia type were found in the duodenum in the Mayo Clinic series. Several polypoid cavernous hemangiomas which prolapsed into the duodenum from the gastric side of the pylorus are not included.

Kaposi's sarcoma involved the duodenum in 4 cases reported in the literature while a record of 1 hemangioendothelioma, grade 1 (Fig. 4), was found in the Mayo Clinic series.

Symptoms, treatment, and prognosis. Tumors of the duodenum cause no characteristic symptoms. The important clinical features which bring them to the attention of the physician are obstruction and bleeding. Many lesions are first encountered at the time of roentgenologic examination which is made because of vague gastrointestinal distress.

When a tumor is palpated in the duodenum during a surgical procedure, it is important to determine its site of origin in order to avoid an unnecessary duodenostomy or duodenectomy for a prolapsing gastric lesion. Manipulation of the tumor may push it back through the pylorus into the stomach where a gastrotomy or gastrectomy is then possible.

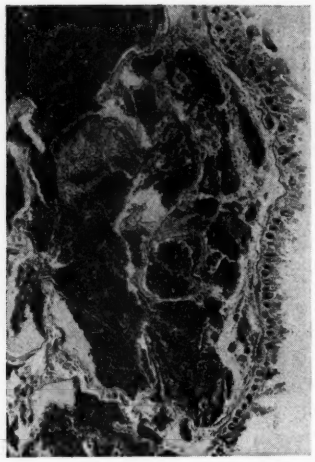

Fig. 5. Cavernous hemangioma of the jejunum, multiple phlebectasia type. Note large blood-filled endothelium-lined spaces with connective tissue septa (hematoxylin and eosin ×24).

Polypoid vascular lesions of the duodenum may be removed by local excision and transverse closure of the operative defect; however, with moderately extensive tumors and a mobile duodenum, partial duodenectomy and even associated partial gastrectomy may be indicated.

Ackerman, in 1937, performed an autopsy in a case in which there were 2 nodular hemangiomas of the duodenum. These tumors had ruptured into the retroperitoneal space where 400 c.c. of blood had collected.

Reports on 16 benign vascular tumors were found in our review of the literature. Seven of these were ulcerated and produced severe gastrointestinal hemorrhages. One compressed the common bile duct and caused progressive jaundice and hepatic failure. Two produced symptoms of partial duodenal obstruction. Nine lesions produced no known symptoms during life. Three patients were free of symptoms after surgical extirpation of the lesion. Five patients died as the direct result of some complication from the benign vascular tumor.

Data on 5 malignant vascular tumors of the duodenum were collected from the literature and from the records of the Mayo Clinic. Four patients died of complications from a Kaposi sarcoma. One patient was living 4 years after surgical extirpation of a hemangioendothelioma, grade 1.

Vascular malformations and vascular tumors of the small intestine. The occurrence of vascular malformations is closely correlated with the embryologic development of the circulatory system in the small and large intestines. The main branches of the mesenteric arteries which supply the intestines are formed early in the mammalian embryo. The earliest capillaries then develop in a fairly definite plane which corresponds to the future submucosa. From this capillary layer the earliest vessels allegedly sprout and form the rami which nourish the smooth muscle and mucosa of the small intestine. Congenital developmental anomalies of the vascular system are more likely to arise in this active, early, developmental layer. The formation of a large part of the small intestine occurs in the later months of fetal life and it is thus reasonable to assume that there is a greater chance that fetal rests remain in this segment of the digestive system. This postulate is substantiated by the observation that more vascular tumors occur in the small intestine than in any other segment of the gastrointestinal tract.

Incidence. Gascoyen is given credit for reporting, in 1860, the first case of hemangioma of the small intestine. Since that time numerous case reports and reviews have mentioned the general incidence of vascular lesions in the small bowel.

Dewis, in 1906, and Helvestine, in 1923, cited the incidence of hemangiomas in the small intestine to be around 1 per cent by comparison with other benign tumors; whereas Geschickter, in 1935, and Merchant, in 1939, considered a much higher figure, 10 or 12 per cent, to be more representative.

Reports on 67 benign vascular lesions of the small intestine were found in the literature and 51 similar tumors were examined in our study of the Mayo Clinic series. The total group of 118 tumors of the small intestine represented more than 41 per cent of all benign vascular lesions found in the gastrointestinal tract during this review. A detailed summary of these cases, including the histopathologic features of the tumors, is presented in Tables II and III. A section of a cavernous hemangioma of the jejunum is shown in Figure 5.

The incidence of malignant vascular tumors, when compared with that of malignant lesions found in the small intestine, was given by Mayo as about 1.1 per cent. In our review, 18 malignant vascular tumors were found to involve the small intestine. This group included 6 hemangioendotheliomas, 10 Kaposi sarcomas, and 2 "benign metastasizing hemangiomas."

It may be seen that, contrary to the fact that usually more malignant than benign lesions of a similar histopathologic type involve the small in-

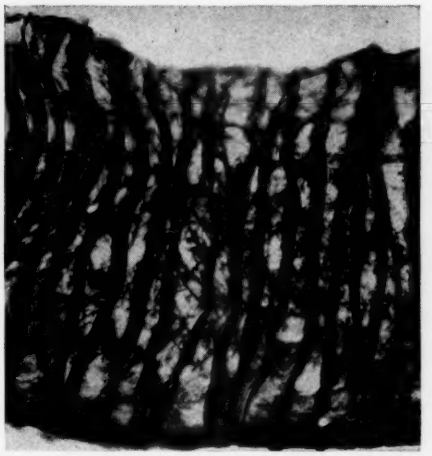

Fig. 6. Transillumination of the ileum reveals translucent valvulae conniventes, submucosal vascular plexus and multiple, opaque, cavernous hemangiomas, multiple phlebectasia type.

testine, in our study only 18 malignant as opposed to 118 benign vascular tumors were found; thus, 87 per cent of the vascular lesions were benign.

Symptoms. Mucosal ulceration and bleeding is a frequent complication of all tumors located in the small intestine. There is, however, a greater risk of exsanguinating hemorrhages associated with vascular lesions because, like old duodenal ulcers which have inflammatory scar tissue and sclerosed blood vessels at their base, the parenchyma of vascular tumors does not have functioning smooth muscle to act as a protective mechanism to close off the large vascular bed from the intestinal lumen. Nineteen per cent of the benign vascular tumors and 20 per cent of the malignant vascular tumors tabulated in this review presented clinical evidence of gastrointestinal bleeding. Four patients died of severe hemorrhage and 4 others died of some complication following operation.

Vascular lesions of the small intestine may produce either partial or complete obstruction by gradual encroachment on the lumen of the bowel or by prolapse and intussusception. The slowly enlarging vascular lesions are associated with vague recurring abdominal pains, distention, gurgling, and increasing constipation. Nausea and vomiting appear late in the course of the disease.

Benign tumors of the small intestine are often cited as the greatest single etiologic agent responsible for intussusception in adults. Nicoll, in 1899, described a double intussusception at the site of a cavernous hemangioma of the small bowel.

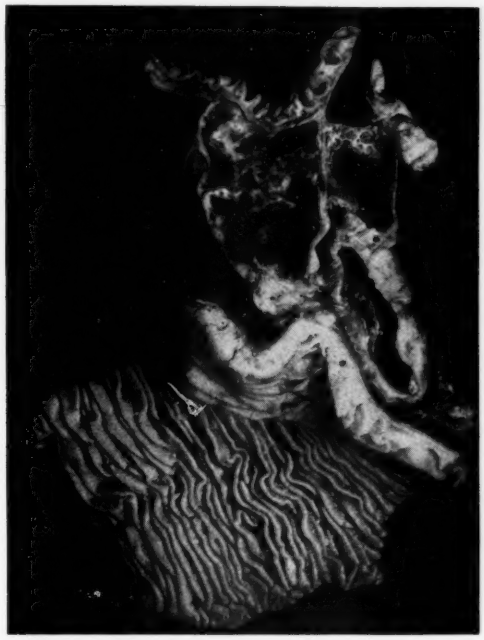

Fig. 7. Diffuse cavernous hemangioma of the jejunum, ileum, and mesentery.

A review of the data on vascular tumors in the small intestine indicated that pain, nausea, vomiting, and perhaps abdominal resistance were the most prominent features in 13 cases, whereas only 4 lesions had actually caused intussusception at the time of operation.

Differential diagnosis. Naumann has described chylangiomas of the intestine which have the same histologic structure as hemangiomas. Their endothelial spaces contain a gelatinous pink-staining material derived from lymph.

A second differential point, to be considered at the time of operation, is chronic congestion of the portal system which may produce saccular dilatations of subserosal and even submucosal veins. The histologic pattern of these lesions is similar to that of veins and not to that of cavernous hemangiomas. Transmitted light may demonstrate a sacculation of the vein wall, which is in contrast to what occurs in hemangiomas which have a separate blood supply and a convex surface toward large veins in the vicinity (Figs. 6 and 7).

Treatment and prognosis. Complications such as intestinal obstruction, intussusception, and severe hemorrhage may require immediate operative intervention after the circulating blood vol-

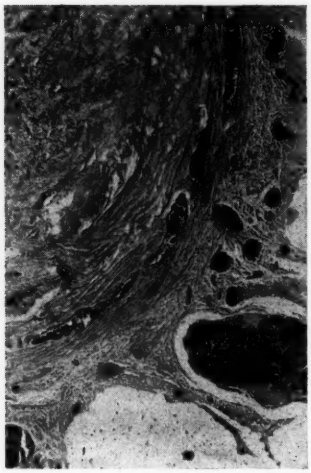

Fig. 8. Diffuse cavernous hemangioma of the vermiform appendix. The serosa of the cecum was also covered by this vascular lesion (hematoxylin and eosin ×24).

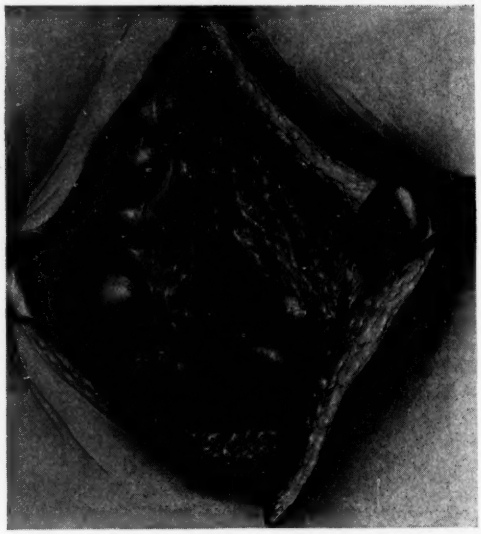

Fig. 9. Diffuse cavernous hemangioma of the cecum and appendix. (From Hunt, V. C.: Hemangioma of the large bowel. *Surgery*, 1941, 10: 652.)

ume and the chemical balance have been restored to as near normal as practical and after anemia has been corrected. Extraluminal benign vascular tumors may be extirpated without incising the mucous membrane or endangering the blood supply of the associated bowel. Resection of a segment is necessary in some cases because of size, extension, and possible malignancy of the lesion.

Palliative forms of treatment such as cauterization, partial extirpation, roentgen therapy, implantation of radon seeds, and injection of sclerosing solutions should be considered only for lesions that are too extensive for adequate resection.

Of 67 benign vascular lesions of the small intestine cited in the literature, 15 were excised with recovery of the patient, and 5 patients died after operation. Fifty-one similar intestinal lesions in the Mayo Clinic series were evaluated in our study, 3 of which were excised with the patients living 5 years after operation, 2 were found too extensive for resection, and 46 caused no known symptoms during life.

One hemangioendothelioma in the small intestine was excised and affected nodes were found at operation. The patient died, 14 months after the onset of symptoms, of extensive local recurrence and metastasis from the original tumor, which was graded 3. Another patient with a hemangioendothelioma, grade 1, was living and well 3 years after operation.

Vascular malformations and vascular tumors of the appendix. Dandy, in 1914, after a thorough search of the literature, was able to collect 10 examples of benign tumors of the appendix and presented the first review of this condition. No vascular tumors were found in this group.

Miescher, in 1928, described an angiofibroma which occurred in the appendix. The symptoms, not unlike those of acute appendicitis, resulted from torsion of the appendix and the associated lesion. The appendix was 17 cm. long and all portions of the vascular system were reproduced in the contiguous tumor.

Since the time of the first report, 2 other vascular tumors of the appendix have been cited in the literature and 4 cases were found in the Mayo Clinic series (Figs. 8, 9 and 10). A clinical summary of these is presented in Tables II and III.

One of the 3 patients cited in the literature and 1 of the 4 patients mentioned in the Mayo Clinic series had symptoms consistent with those of acute appendicitis. Three vascular lesions were noted during surgical exploration for other conditions, while 2 cases were not reported in detail. The appendix was removed in 5 of the 7 cases. No postoperative complications or subsequent death could be attributed to the presence of these vascular tumors. One patient in the Mayo Clinic series had a hemangioendothelioma, grade 1. He died at home, 2 years after resection of the tumor, during a tonsillectomy.

Vascular malformations and vascular tumors of the colon, rectum, and anus. Increasing emphasis has been placed on improvement of diagnostic methods as applied to the study of intestinal dysfunction. The appearance of gastrointestinal bleeding, cramping abdominal pains, or any change in bowel habits is now evaluated not only by the study of stool specimens but by extensive use of the proctoscope, sigmoidoscope, and roentgenoscope. Consequently, many of the rare lesions, such as the vascular tumors, are now more frequently encountered, and further emphasis on reporting these cases in the literature has led to a better understanding of their relative incidence, complications, treatment, and prognosis.

A comparison of numerous reports and various estimates of the general incidence of vascular tumors of the colon shows a marked discrepancy, depending on whether surgical material or autopsy specimens are examined. The incidence observed at autopsy also depends on the care taken to note benign lesions, whereas the incidence at operation is higher for those lesions which commonly produce severe symptoms.

Bensaude and his coworkers (26), in 1932, classified 15 cavernous hemangiomas of the rectum, sigmoid, and anus which had been reported in the literature. They arbitrarily separated them into the "ano-recto-sigmoidal" cases in which involvement of the skin did not occur and the "genito-perineo-rectal" types in which involvement of the skin did occur. Eleven lesions were confined to the mucous membrane and 4 caused related involvement of the skin.

Hunt, in 1941, stated that there were apparently only 20 cases recorded in the literature in which hemangioma had been encountered in the large bowel at operation or autopsy.

Reports of 61 benign and 9 malignant vascular lesions located in the colon and rectum were found in the literature and summarized in our review. That is, of 234 benign and malignant vascular lesions which were found in the gastrointestinal tract, 70 lesions, or 30 per cent, were located in the colon, rectum, and anus.

Thirteen benign and 2 malignant vascular tumors were found in the Mayo Clinic series. Thus, from a total of 110 vascular lesions spread throughout the gastrointestinal tract, 15 lesions, or 14 per cent, were located in the large bowel, rectum, and anus.

Data on the cases of vascular lesions occurring in the colon, rectum, and anus are given in Tables II and III.

Symptoms. In patients with vascular lesions of the colon symptoms may develop from either intestinal obstruction or severe hemorrhage. Cavernous hemangioma must be considered in the differential diagnosis of any rectal bleeding during the first year of life.

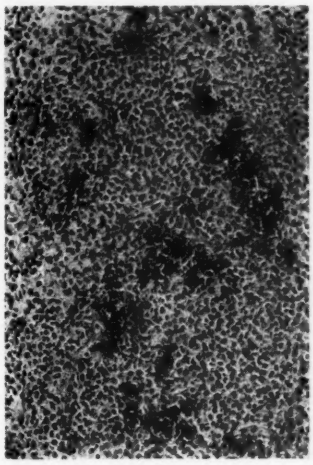

Fig. 10. Hemangioendothelioma, grade 1, of the vermiform appendix. Note vascular spaces or cavities surrounded by polygonal endothelial cells with oval or fusiform nuclei and with scattered mitotic figures (hematoxylin and eosin ×82).

The patients in 42 of the 85 cases encountered in our review had either acute or chronic episodes of bleeding into the bowel lumen; therefore, since 16 vascular lesions were noted only as incidental findings at autopsy, in 42 of 69, or 61 per cent, of the clinical cases some type of intestinal hemorrhage was demonstrable. The serious prognosis for patients with a diffuse expansive cavernous hemangioma of the colon or rectum has been considered in the section on pathology.

Vascular lesions may produce acute or chronic intestinal obstruction as a result of (1) gradual enlargement of the lesion with resulting occlusion of the intestinal lumen, (2) intussusception, or (3) volvulus. Obstructive symptoms were observed in 12 of the 69 clinical cases found in this review.

Vascular lesions occurring in and around the rectum may cause urgency, rectal tenesmus, incomplete stool evacuation, and the sensation of prolapse or extrusion of a mass from the anus. A primary cavernous hemangioma in this location may erode through the bowel wall into contiguous structures. Rectovaginal fistulas developed in 2 cases.

Differential diagnosis. The criteria for roentgenologic diagnosis of vascular lesions in the colon

Fig. 11. Single polypoid cavernous hemangioma of the rectosigmoid. Note large submucosal blood-filled spaces with thrombosis and calcium deposits (hematoxylin and eosin ×24).

are similar to those for other tumefactions occurring in this segment of the intestinal tract. Phleboliths or calcareous concretions may form in the cavernous spaces of a hemangioma and have been observed in a few cases during roentgenologic examination. Digital examination reveals the nodular character of rectal lesions and, on direct proctoscopic observation, they appear bluish in color from the blood which may be aspirated from the vascular sinuses.

Treatment. The treatment of these lesions depends, as in other types of benign and malignant tumors, on their location, degree of extension, and their association with other intraperitoneal structures.

The capillary hemangioma, mixed capillary and cavernous hemangioma, and the simple polypoid cavernous hemangioma may be removed by transcolonic excision; however, the benignancy of large lesions may be questionable and, in this event, radical resection of the contiguous segment of colon and associated mesenteric nodes carries a better prognosis.

Multiple cavernous hemangiomas of the phlebectasia type seldom produce symptoms and, unless a definite source of bleeding is noted at the time of operation, any type of resection is associated with a higher mortality rate than is conservative management.

The single and multiple diffuse cavernous hemangiomas (Figs. 11, 12, and 13) present the most serious complications of all benign vascular

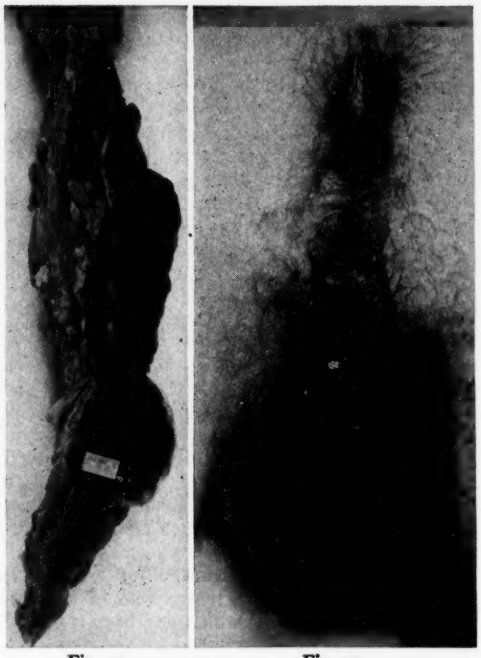

Fig. 12. Fig. 13.

Fig. 12. Extensive diffuse cavernous hemangioma of the sigmoid and rectum. A second cavernous hemangioma was found in the pelvis of the right kidney.

Fig. 13. Multiple, diffuse, cavernous hemangiomas of the anus, scrotum, and penis. A single, ulcerated, polypoid, cavernous hemangioma was removed from the sigmoid.

tumors and are extremely difficult to treat. Many of these lesions are very extensive and involve other intra-abdominal structures, a fact which, with radical resection, leads to a prohibitive surgical mortality rate. Ligation and injection of the vascular bed supplying a large cavernous hemangioma has a very limited field of application, not only because of the danger from intestinal necrosis or severe hemorrhage, but also because few hemangiomas, unless very small, have disappeared after a single injection of sclerosing solution. Operations which sidetrack the lesion have been undertaken but these procedures alone leave a potential source of hemorrhage. Colostomy, followed by high voltage roentgen therapy, has been successful in a few cases. Resection of the scarred and stenosed colon together with the remaining partially sclerosed tumor may then be considered.

Many of the diffuse cavernous hemangiomas of the rectum and sigmoid colon are so extensive that combined abdominoperineal resection or posterior

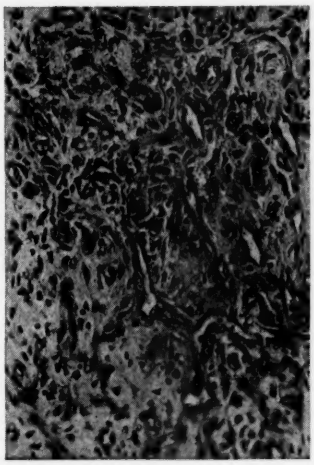

Fig. 14. Hemangioendothelioma of the rectum, grade 1, with spindle-shaped and oval-shaped endothelial cells inclosing imperfect capillaries. Rare giant cells and mitotic figures are visible (hematoxylin and eosin ×173).

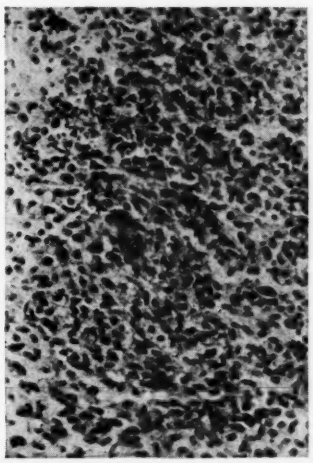

Fig. 15. Hemangioendothelioma, grade 3, of the rectum. Atypical endothelial cells with numerous mitotic figures and pleomorphic giant cells are visible (hematoxylin and eosin ×173).

resection seems impractical; however, the prognosis for the patient has been so serious that extensive resection should be carefully considered.

The hemangioendotheliomas (Figs. 14 and 15) should be widely excised and high voltage roentgen therapy or local application of radium should be used in the postoperative period.

Summary

This study included a review of the available literature on the subject of vascular malformations and vascular tumors which involve the gastrointestinal tract. Because of the extreme infrequency with which these cases occur, it seemed desirable that every report encountered in the literature be summarized to amplify our knowledge of this subject. Data on 189 cases of benign vascular lesions and 45 cases of malignant vascular lesions were collected from the literature.

The clinical histories and pathologic specimens in 94 cases of benign vascular lesions and 16 cases of malignant vascular lesions of the gastrointestinal tract, found at operation or autopsy at the Mayo Clinic, were also available for study.

The histogenesis of vascular lesions is frequently obscure; therefore, a more practical method of classification has been presented, which is derived from a study of the histopathologic structure of the lesions.

A review of studies on the experimental production, metastasis, and transplantation of hemangioendothelioma in white mice has been presented.

The symptoms, diagnosis, and treatment of vascular lesions depend on the specific anatomic segment of the gastrointestinal tract which is involved as well as on the histopathologic structure of the lesion; therefore, a study of each separate unit of the digestive tract has been included in this review.

Conclusions

1. Vascular malformations and vascular tumors are among the rarest lesions found in the gastrointestinal tract. It has been roughly estimated from this study that they occur once in approximately 14,000 patients.

2. The histogenesis of vascular tumors of the gastrointestinal tract is obscure; however, a consideration of their histopathology can be of assistance in determining adequate methods of treatment and prognosis.

3. Hemangiomas are rarely of one pure type. Classification of them depends primarily on grouping together different lesions which have the same cellular arrangement.

4. The criteria for an absolute diagnosis of gastrointestinal telangiectasia, as with other vascular lesions, should be limited to those based on histopathologic study.

5. Although in some of the reported cases of gastrointestinal telangiectasia death followed a severe hemorrhage (14 per cent), radical extirpation of these lesions is impractical because of their multiplicity and their tendency toward spon-

taneous regression. Repeated injections of moccasin venom or the administration of rutin may decrease the tendency to bleed.

6. A large majority of the patients with a capillary hemangioma of the gastrointestinal tract experienced symptoms during life (89 per cent); surgical extirpation was undertaken in many (78 per cent), and only a few died as a direct result of their lesion (11 per cent).

7. The mixed capillary and cavernous type of hemangioma may be a transition stage between the two major developmental groups or it may result from evolutionary changes which appear in every hemangioma with growth and aging.

8. The cavernous hemangioma of the multiple phlebectasia type is more commonly observed, both at operation and autopsy, than is any other vascular lesion found in the gastrointestinal tract.

9. The polypoid vascular tumors tend to cause intussusception and obstruction, whereas the sessile lesions are more likely to develop surface ulceration and produce gastrointestinal hemorrhage.

10. The majority of small benign vascular lesions of the gastrointestinal tract are associated with the submucosal capillary plexus, whereas the diffuse expansive cavernous hemangioma involves large arteries and veins.

11. The diffuse cavernous hemangioma tends to expand over the surface of adjacent structures in the peritoneal cavity not associated with the gastrointestinal tract; however, unless the normal vascular segment which supplies these other organs or tissues demonstrates cavernous changes there will be no communication between the tumor and the blood supply of the contiguous normal structure.

12. When multiple and often mobile deposits of calcium are seen on roentgenographic examination, the diagnosis of a vascular tumor should be considered.

13. More than two-thirds of the benign vascular tumors of the gastrointestinal tract were found in males, whereas the malignant vascular tumors were about equally divided between the sexes.

14. The evidence indicates that a majority of all benign vascular tumors (66 per cent) and all malignant vascular tumors of the gastrointestinal tract produce symptoms during the patient's life.

15. The hemangioendothelioma is more frequently observed than any other type of malignant vascular lesion found in the gastrointestinal tract.

16. Many of the hemangioendotheliomas appear in young adults who may give a history of relatively long duration of symptoms. The prognosis is excellent for those patients with low grade lesions which are surgically excised and followed by extensive radiation therapy. The higher grade lesions metastasize early to both local and distant parts of the body through the lymphatic channels or blood stream, and the patients are rarely cured after removal of the primary growth, even when removal is followed by extensive radiation therapy.

17. Many benign and malignant vascular tumors of the gastrointestinal tract encountered in our review of the literature and in the Mayo Clinic series were surgically excised and the patients had no further symptoms (30 per cent).

18. Unless more patients who have gastrointestinal bleeding of indeterminate origin, symptoms and signs of intestinal obstruction, or a freely movable abdominal mass are given the benefit of abdominal exploration, 1 of 9 patients with a benign vascular tumor and 1 of 2 patients with a malignant vascular tumor will die, according to the data obtained in our investigation.

19. The small intramural or sessile vascular tumors of the esophagus rarely produce symptoms; however, those which cause obstruction or hemorrhage have, thus far, been incompatible with life.

20. Vascular malformations and vascular tumors of the stomach are rarely encountered; however, their importance is emphasized by a high incidence of severe complications, the frequent occurrence of malignant change, and the satisfactory prognosis after their adequate surgical removal.

21. Contrary to the belief that usually more malignant tumors than benign tumors are found in the small intestine, we found that 82 per cent of the vascular tumors were benign.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Visual Protection in Aerial Warfare. P. C. LIVINGSTON. *Brit. J. Ophth.*, 1948, 32: 689.

The introduction of equipment aimed at preserving vision of aircrew personnel requires maintenance of morale, that they not become eye conscious, and that they use the equipment on operational duty. The low number of eye injuries sustained by the Royal Air Force in flying operations indicates the value of a planned campaign against ocular injuries.

The preservation of sight can be aided by the use of bullet proof glass screens and armor plates, whose use is restricted by weight. Further protection can be effected by the use of safety glass in flying goggles, which can also be ground to correct refractive errors. Contact lenses are of limited use because of intolerance due to ocular sensitivity. An indirect method of protection was visual training to quicken the powers of recognition of aircraft and improving rod vision under conditions of low illumination.

FRANK W. NEWELL, M.D.

Histological Findings in a Case of Angioid Streaks. F. H. VERHOEFF. *Brit. J. Ophth.*, 1948, 32: 531.

The author discusses angioid streaks of the retina. Ophthalmoscopically this basophilic condition (calcification) brightens the contiguous fundus and renders more conspicuous the dark red choriocapillaris exposed by the ruptures in Bruch's membrane (producing streaks). Proliferative changes which may occur along or within the streaks may alter their appearance.

Ruptures which occur in senile eyes do not widen into visible streaks probably because the senile choroid loses its elasticity before Bruch's membrane becomes calcified.

Other lesions of the macula in cases of angioid streaks are due to proliferative changes affecting the pigment epithelium (senile degenerative changes). The subretinal hemorrhages in the macula and elsewhere are ascribed to fractures of the calcified membrane causing ruptures of the choriocapillaris. If such a hemorrhage elevates the pigment epithelium in the macula, "disciform degeneration" results.

Hemorrhages within the retina, as well as circinate retinitis are attributed to the vascular changes that commonly occur in cases of angioid streaks.

It is difficult to explain the presence of angioid streaks in association with some cases of pseudoxanthoma elasticum, with Paget's disease, with cardiovascular disease, and in some cases as an isolated phenomenon. The associated conditions may be dependent upon heredity.

According to histologic examination, angioid streaks represent ruptures of Bruch's membrane. The gaps are widened by the elastic tension of the choroid.

JOSHUA ZUCKERMAN, M.D.

Participation of the Ocular Appendages in Sympathetic Ophthalmia and Its Bearing on Enucleation. BERNARD SAMUELS. *Brit. J. Ophth.*, 1948, 32: 569.

The author divides his paper into several sections. The first section has to do with the nature of sympathetic ophthalmia. In it he declares that this condition is in the nature of an infiltration and selective affinity for uveal tissue, but a characteristic feature of the condition is the tendency of spread outward beyond the globe.

The next section has to do with the pathways of the virus, namely, (1) along the uveal tract, (2) through the globe into tissues of the orbits, and (3) into the optic nerve. Histologic sections show the infiltration process in the orbit outside of the globe and in and around the optic nerve. The nerve sheaths are involved only in far advanced cases.

In the last section the author concludes that when the exciting eye is enucleated as a preventive measure before signs of inflammation are seen in the second eye, an ordinary, simple enucleation is sufficient. However, if signs of inflammation appear in the second eye, the enucleation of the exciting eye should include removal of the inferior oblique muscle, the optic nerve as far as possible, the retrobulbar tissues almost to the apex of the muscle cone, and the globe itself. The wound should be left open to drain.

EARL H. MERZ, M.D.

Radiotherapy of Malignant Intraocular Neoplasms. H. B. STALLARD. *Brit. J. Ophth.*, 1948, 32: 618.

Radiotherapy is excellent for retinal glioma, but the treatment of malignant melanomas by radon seed is not satisfactory. Metastatic carcinoma of the eye requires treatment of sufficient strength to destroy it and yet not destroy the eye. This is difficult and the object of this work.

The treatment is done with plaques of platinum or silver 0.5 mm. thick, containing radium salt, curved to fit the sclera over the site of the neoplasm, and fixed by sutures through the episclera at this point. The advantage is a more even and accurate distribution of irradiation to the neoplasm. Illustrations are shown.

The dose given is the maximum dose that the eye tissues will stand without serious destructive changes. A dose of 3,500 roentgens seems quite effective.

The results are good when the neoplasm occupies one quadrant of the globe or less.

The complications commonly encountered are: (1) cataract, (2) retinal detachment, (3) intraocular hemorrhage, and (4) shrinkage of the globe.

EARL H. MERZ, M.D.

Goniotomy for the Relief of Congenital Glaucoma. OTTO BARKAN. *Brit. J. Ophth.*, 1948, 32: 701.

Goniotomy is an operation for stripping or peeling embryonic tissue from the angle wall. The author has used the technique in 76 eyes with congenital glaucoma, and in 66 of these the pressure was normalized and vision was maintained or restored.

The early symptoms of congenital glaucoma are due to an increase in intraocular pressure and consist of corneal cloudiness, hyperemia of the bulbar conjunctiva, photophobia, epiphora, and blepharospasm. The onset of symptoms is usually before the fourth month and in some cases may occur with extreme suddenness.

The ocular hypertension causes corneal cloudiness which in the early stages is completely reversible by surgery or with drugs. Persistence of the cloudiness causes a milky opacification and irregular astigmatism which prevents the development of central vision. Optic atrophy occurs only after the intraocular pressure has been elevated for a long period.

The angle in congenital glaucoma shows the iris to be inserted anterior to its normal position by means of adventitious mesoblastic tissue. The area of transition from the anterior surface of the iris to the posterior surface of the cornea consists of gelatinous looking semitransparent substance. In eyes successfully operated upon the embryonic tissue was stripped from the angle through one-fourth to one-third of its circumference.

The operation is indicated in all cases of congenital glaucoma in which the increased pressure is the result of obstruction of the angle by persistent embryonic tissue. In general, the earlier the operation is done after the onset of symptoms the more effective it is in restoring vision. Goniotomy is contraindicated in eyes in the advanced stage with scarring and a corneal diameter of more than 15 mm.

The operation is performed under ether-oxygen anesthesia. The initial success is enhanced if a contact lens is used; with marked cloudiness of the cornea, preliminary abrasion of the corneal epithelium permits its use. An assistant maintains fixation and with the contact lens in position the anterior chamber is entered with a goniotomy knife 1 mm. anterior to the limbus in the superior inferior temporal quadrant. The knife crosses the pupil, its blade is inserted anterior to the root of the iris, and then rotated counterclockwise in this plane as long as visibility permits. The knife is then removed and a few seconds later a slight venous oozing occurs which is absorbed in a few hours. Eserine ointment and binocular pads are applied.

Complications include failure to strip the angle, iridodialysis, and hemorrhage. Early diagnosis and prompt surgery are essential for good results.

FRANK W. NEWELL, M.D.

EAR

Reconstruction of the External Ear. HERBERT CONWAY, CHARLES G. NEUMANN, JEROME GELB, LEO L. LEVERIDGE, and JULIUS M. JOSEPH. *Ann. Surg.*, 1948, 128: 226.

Reconstruction of the external ear for the correction of substance lost by reason of congenital postinfectious or posttraumatic defects, or following the excision of a malignant tumor, represents one of the most difficult problems in plastic surgery. An abnormal ear is conspicuous, and an absent one is a major cephalic deformity. Criteria for successful reconstruction have been set down by Suraci who lists seven points as essentials if the reconstruction is to be acceptable to the patient and to the surgeon. These are: correct size, similarity of outline, similarity of height, correct cephaloauricular angle, permanency of size and shape, rigidity, and matching color.

The general principles of the technique of Pierce, who reported 4 cases in which he used fine cartilage as an inlay graft combined with a cervical tubed pedicle to construct the helix, have been followed with agreement in execution with the advancements of Brown and others. In several cases subtotal reconstruction of the ear has been carried out in two stages. The management of cases included in this report has led to the opinion that suitable reconstruction of the external ear can be accomplished if sufficient attention is given to the cutting and the carving of costal cartilage, to the importance of the establishment of a lateral concavity to represent a concha, and to the many minor details which enter into the execution of this type of reconstructive surgery.

Experience in the handling of fresh costal cartilage has led to observations which have contributed to success in obtaining a suitable restoration of the external ear. A common objection to the use of straight grafts of cartilage in reconstructive surgery is that, after transplantation, the graft may undergo distortion of shape, curling. The use of a gouge causes compression of medullary and cortical cells of the costal cartilage in such a way that, even after carving, the graft tends to warp or curl. The use of two scalpels prevents abnormal compression of cells and minimizes this tendency. In order to obtain a large graft, two adjacent rib cartilages are resected en bloc. The excision of a disc, 2 to 3 mm. in thickness, at the level of each transection makes easier the removal of such a block of cartilage. Inspection of such a graft from its posterior aspect shows that there is a concavity in the cartilaginous portion of the thoracic cage. This can be used effectively in the carving of cartilage for reconstruction of the ear. As the rib cartilage is split longitudinally, advantage is taken of the curling effect to exaggerate this concavity. Cartilaginous or fibromuscular fusion of two adjacent cartilages is made use of in obtaining the desired width of graft. With attention to these details, it is possible to cut and carve, from costochondral cartilage, a free graft which has size, shape and rigidity, suitable for reconstruction of the external ear.

Ten cases are reported in which partial or complete reconstruction of the external ear has been carried out. Reconstructions have been effected by the use of buried free grafts of cartilage, their elevation from the head and their backing by free grafts of skin at a second operation. A small tubed pedicle has been used to effect the appearance of the helix in some cases. Technical details in the cutting and carving of costal cartilages have been set down.

The opinion is advanced that reconstruction of the external ear, acceptable to both patient and surgeon, can be effected if attention is given to these details.

JOHN F. DELPH, M.D.

Problems of Diagnosis in Obstruction of the Eustachian Tube. FREDERICK T. HILL. *Ann. Otol. Rhinol.*, 1948, 57: 343.

The author believes there are four main causes of obstruction of the eustachian tube: (1) nasopharyngeal lymphoid hyperplasia; (2) acute upper respiratory infection; (3) malocclusion of the bite with resulting compression of the tube; and (4) the possibility of a nasopharyngeal tumor.

Three cases of tumors and one case of a luetic lesion of the torus tubaris, which led to obstruction of the eustachian tube, are reported.

JOHN J. BALLENGER, M.D.

Clinical Record—Gradenigo's Syndrome, with Report of 2 Cases. S. HOROWITZ. *J. Lar. Otol.*, Lond., 1948, 62: 639.

The author discusses Gradenigo's syndrome—its incidence, clinical manifestations, x-ray appearance, etiology, pathology, and treatment.

The syndrome usually occurs during childhood and adolescence, although no age group is exempt, and the majority of cases are in males. The right ear is slightly more affected than the left.

The syndrome is characterized by three outstanding symptoms: (1) suppuration of the middle ear; (2) intense pain, usually intermittent over one or more branches of the fifth cranial nerve; and (3) loss of function of the external rectus muscle. In most cases the pain is intermittent, rather severe, worse at night, and occurs mainly over the temporoparietal region, although commonly in back of the eyes. The distribution varies, and the fibers of the gasserian ganglion mainly are affected. Anesthesia of the cornea may occur. Some patients may complain of pain on motion of the eye. The most outstanding symptom is paresis or paralysis of the sixth cranial nerve, usually on the side affected, but occasionally on the contralateral side or, more rarely, on both sides. The third, fourth, seventh, or eighth nerves have occasionally been involved. Paralysis of the abducens nerve leads to symptoms of diplopia; it is observed in the late stages of mastoiditis and is uncommon in the early stages. The average time is from 20 to 40 days after the onset of the ear infection.

If appropriate treatment is carried out, normal function is restored in from 2 to 4 months, but occasionally it takes as long as 6 months. Frequently nystagmus may accompany the paralysis and occasionally the patient complains of photophobia. The temperature may be normal, but more often it is between 100 and 102 degrees, and in some cases as high as 104 or 105 degrees.

The x-ray appearance is indicative of the condition of the mastoid and the petrous apex. Positive findings are helpful, but negative findings do not exclude a pathologic process.

The disease begins in the middle ear, and the infection passes to the petrous apex by the continuity of cells, or by direct bone extension. The sixth nerve is affected in the apex of the pyramid when the dura is swollen from the infection, with resulting pressure on the nerve. The disease may also be complicated by a localized meningitis and extradural brain abscess, or by an extension of thrombosis from the lateral sinus up to the inferior petrosal sinus. Petrous invasion is more common in the pneumatized temporal bones because the infection can more readily enter the petrous apex by advancing along this cellular structure. There are two main routes of cells extending to the petrous tip—the "antrum-epitympanic" route and the "hypotympanic" route. The organisms involved in the process are usually the pneumococci and streptococci, but almost any organism can cause the disease.

The prognosis of the disease depends upon the treatment that is given, the accessibility of drainage, and the duration of the disease. The mortality varies from 2 per cent to as high as 20 per cent, but with the use of sulfonamides and antibiotics, it is hoped that the prognosis may improve.

With regard to treatment, the author states that on rare occasions cure may take place spontaneously, but at times the syndrome may terminate in generalized meningitis and death. Surgical intervention with operation on the mastoid is usually required in order to obtain favorable results; occasionally myringotomy suffices. About 80 per cent of patients will recover after simple mastoidectomy, but radical mastoidectomy, and even petrosectomy, is necessary at times. The use of sulfonamides and antibiotics will assist further in effecting a favorable outcome.

The author presents reports of 2 cases of Gradenigo's syndrome. One case was that of a child, aged 14, with acute mastoiditis and lateral sinus thrombosis. This child also developed an otitic hydrocephalus. The second case was that of a 30 year old woman who developed Gradenigo's syndrome in the typical manner, from a highly pneumatized mastoid and petrous bone. Following radical mastoidectomy, supplemented by antibiotic therapy, both patients made a complete recovery.

WILLIAM A. AHROON, M.D.

The Functions of the Round Window. ERNEST GLEN WEVER and MERLE LAWRENCE. *Ann. Otol. Rhinol.*, 1948, 57: 579.

The authors present a study of function of the round window. Immobilization was accomplished in various ways while the electrical potentials of the

cochlea were recorded, in order to evaluate claims of improved hearing resulting from surgical treatment by the use of round window grafts.

Fourteen cat ears, with a ventromedial approach to the auditory bulla, were used in the experiments. The cochlear potentials were recorded by an electrode placed on the round window membrane and this system was calibrated with the amplifying system to show the magnitude of the response in absolute units. The authors' procedure was to measure the response of the ear to a series of tones under standard conditions with (1) the round window free, (2) the round window blocked by one of several agents and (3) with the block removed. The results from blocking were expressed as differences in decibels. The experiments were divided into 4 series.

Series 1. Immobilization of the round window membrane was accomplished by manual application of a nonconducting, thin-shanked lucite probe in contact with the central half of the membrane's surface and producing a noticeable indentation. Not the slightest effect was seen upon the response of the ear to a continuing sound.

Series 2. Occlusion of the round window by an air-tight pressure tube with the other end open to the air reduced the response to high tones slightly as measured in 3 cats. The reduction in response began around 500 cycles and increased regularly as the frequency rose to a maximum loss of around 10 decibels at 10,000 cycles.

With the tube held in the same position, and an introduction of air pressure up to 25 mm. of mercury, the reduction in response noted was similar to that caused by the simple application of the tube.

Series 3. The third method of immobilization was by a bone wax pack pressed in place by a mechanically held lucite obturator. The authors believed that the responses suffered a small general impairment varying with frequency, from 1 or 2 decibels at lower frequencies to 4 or 5 decibels at higher frequencies.

To test the possibility that the tube or obturator was interfering with the sound field, the lucite obturator was placed in its usual position without actual contact, and no response was observed.

Series 4. In this experiment, the lateral wall of the tympanic cavity with the drum and ossicles was removed, and the sound tube with acoustic probe was sealed over the oval window so stimuli could be delivered directly to this site. After blocking the round window with wax, there was little change in response to high tones, but in some ears there was a reduced response to low tones, although the exact amount in decibels was not stated by the authors.

From these experiments the authors formulate the following conclusions as to the nature of the mechanical change resulting from blocking the round window:

In the presence of the middle ear, loading the round window adds mass to the responsive system; whereas, in the absence of the middle ear, the same treatment of the round window adds stiffness to the responsive system. Furthermore, the authors suppose that the middle ear contributes greatly to the stiffness of the cochlear system and less significantly to its mass, this supposition being consistent with a previous study showing that removal of the middle ear affects most seriously the high tones.

In conclusion, the authors state that there is no warrant for the use of an immobilizing procedure in clinical practice, since the introduction of grafts into the round window can be of no benefit to hearing.

EUGENE L. DERLACKI, M.D.

Electrocoagulation of the Membranous Labyrinth. Experimental Histological Studies in the Monkey. LEROY A. SCHALL and J. H. TOM RAMBO. *Ann. Otol. Rhinol.*, 1948, 57: 590.

The authors report their conclusions from histological studies of 7 ears in 5 monkeys operated on according to Day's procedure of coagulating the membranous labyrinth through a trephine opening in the lateral semicircular canal.

The stated purpose of the experimental studies was to demonstrate the histological changes occurring as a result of coagulation of the membranous labyrinth and to determine, if possible, any variation of technique which might improve the prognosis for hearing.

Two of the ears were not included in the reported findings because of postoperative labyrinthitis caused by unintentional surgical accidents providing an avenue of infection.

The remaining 5 ears were classified according to the amount of current used, and the postoperative date of sacrifice, as follows:

	Dial setting	No. Postoperative days
1	20	10
2	20	30
3	20	40
4	10	30
5	30	30

In the 4 ears in which the coagulating current with a dial setting of 20 or more was applied, the membranous labyrinth was completely destroyed, and the healing of the labyrinth occurred by fibrosis, with progressive changes to bone formation. In the ear with the current reduced to a dial setting of 10, the only finding was incomplete destruction of the utricle and saccule. Thus, the authors felt, with the use of optimum current, complete and predictable damage to the membranous labyrinth results, and elimination of vertigo in Meniere's disease could be expected as a uniform result.

On the other hand, the essayists found that there was no predictable correlation in the amount of damage to the cochlea resulting from a variation either in the amount of coagulating current used or the time elapsed since the operation. In 1 ear there was no damage to the cochlea; in the remaining 4 ears the damage varied from localized injury to the organ of Corti and the spiral ligament immediately adjacent to the vestibule (in 1 case) to varying degrees of exudate in the lymphatic spaces and atro-

phy of the functional elements. With the unpredictable cochlear damage, the authors believed that retention of serviceable hearing following operation by Day's procedure was improbable.

EUGENE L. DERLACKI, M.D.

The Radical Mastoid Operation. N. ASHERSON. *J. Lar. Otol.*, Lond., 1948, 62: 568.

The author presents a preoperative and postoperative audiometric statistical survey of hearing loss in chronic otorrhea. The study is based on 535 ears examined clinically and audiometrically in the course of ear consultations for a Medical Board. The stated purpose of this presentation is to demonstrate in a statistical survey that the otologist may venture an opinion by otoscopy alone of the hearing loss in decibels within an insignificant limit of error in cases of chronic otorrhea, without any interrogation or testing of the patient, or knowledge of the past history.

The statistical survey is an analysis of the hearing in 478 ears with chronic otorrhea under the following headings: (1) 55 ears with a radical mastoid cavity; (2) 21 ears with a cortical (simple) mastoid operation; (3) 153 ears with chronic otorrhea with granulations and/or cholesteatoma; (4) 38 ears with aural polyps; (5) 30 ears with attic disease; (6) 14 ears with subacute otorrhea; (7) 102 ears with active or healed otorrhea, with a residual permanent perforation of the tympanic membrane; and (8) 66 dry ears with the tympanic membrane healed.

All of these ears were tested by the acumeter, whispered and conversational voice, and the audiometer.

The hearing of patients in each of these classifications was shown in composite audiographs, apparently an average of all the ears in each group.

Group 1. Thirty-seven ears, those with a radical mastoid cavity, averaged in the composite audiograph. Apparently, those cases which have been classified as demonstrating a complete loss of hearing are averaged at a 90 decibel loss. The audiograph showed loss averages of 50 to 60 decibels for frequencies up to 2048, and 60 to 80 decibels for the higher frequencies.

Group 2. Twenty-one ears on which a cortical mastoid operation had been performed. In this grouping, in which hearing in the other ear was normal, the average impairment is 15 decibels for frequencies up to 4096, and 25 to 45 decibels for the higher frequencies. Where the other ear showed permanent defective hearing and the tympanic membrane on the operated ear showed an attic scar, the hearing loss was 40 to 50 decibels for frequencies up to 2048, and 50 to 70 decibels for higher frequencies.

Group 3. One hundred and fifty-three cases of chronic otorrhea with granulations and/or cholesteatoma. The average hearing loss is 40 to 45 decibels for frequencies up to 2048, and 50 to 60 decibels for the higher frequencies.

Group 4. Thirty-eight ears with aural polyps showed an average loss of 50 to 55 decibels for frequencies up to 2048, and 60 to 80 decibels for the higher frequencies.

Group 5. Thirty ears with disease confined to the attic region. The composite audiograph shows a uniform loss of hearing of 25 to 30 decibels up to 2048, above which it varies from 25 to 65 decibels in increasing progression.

Group 6. Fourteen ears with subacute otorrhea. The hearing loss averaged 20 to 25 decibels up to 2048, and 30 to 55 decibels for the higher frequencies.

Group 7. One hundred and two ears with active or healed otorrhea, with a residual permanent perforation of the tympanic membrane. The average loss was 25 to 30 decibels for frequencies up to 2048, and progressively from 30 to 50 decibels in the higher frequencies. This entire group was divided in several ways according to size of perforation and presence of moisture. Conclusions were that the ear which is discharging has a greater hearing loss, not usually exceeding 5 decibels, than when the ear is dry; and the hearing loss is more marked for the large central perforation by an average 5 to 10 decibels.

Group 8. Sixty-six ears with healed tympanic membrane. The average loss was 20 decibels for the frequencies up to 2048, and 30 to 50 above this.

In addition, the author presents a composite audiograph of 44 ears with otitis externas. The hearing is almost within normal limits except for a high tone loss attributed to secretions in the ear.

EUGENE L. DERLACKI, M.D.

NOSE AND SINUSES

Tumors of the Nose and Sinuses. LEROY A. SCHALL. *J. Am. M. Ass.*, 1948, 137: 1273.

During the past 16 years, from 1930 to 1945, inclusive, a total of 219 patients with malignant disease of either the nose or the nasal accessory sinuses, or of both, were seen at the Massachusetts Eye and Ear Infirmary, Boston.

A recent survey reveals that among these 219 patients there were 139 males and 80 females. Their average age was 56 years, the youngest patient being 16 and the oldest 83 years of age. Ten of these 219 cases were untraced and 62 (30 per cent) showed a 5 year or longer survival.

The relation of the treatment to the survival rate may be summarized as follows:

Primarily surgical treatment... 5 year survival in 123
Primarily radiation treatment... 5 year survival in 72
Primarily radium therapy..... 5 year survival in 10

The successful treatment of cancer of the nose and nasal accessory sinuses, as of cancer elsewhere, depends largely upon early diagnosis, prompt and thorough treatment, and treatment that is neither too little nor too late.

The symptoms which may lead one to suspect cancer of this area are few in number and can easily be listed: (1) hemorrhage, (2) nasal obstruction, (3) referred pain to the teeth, (4) painless swelling, (5) paresthesia or anesthesia of the cheek, and (6) exophthalmos.

When a new growth is limited to the nasal cavity, nasal obstruction and hemorrhage are the most frequent symptoms. A small growth of the anaplastic type with thin-walled blood vessels may show early ulceration with subsequent hemorrhage as its first symptom. With the increase in size of the growth, nasal obstruction occurs. This obstruction is usually unilateral; hence it is an axiom that any unilateral obstruction by a growth should be considered malignant until the microscope proves it otherwise. When the tumor is of the slowly growing variety, with well developed connective tissue and thick-walled blood vessels, hemorrhage may not occur and the only early symptom is that of nasal obstruction. The growth may have the appearance of a simple nasal polyp; yet on its removal, the hemorrhage may be excessive, and this is suggestive of cancer.

The study shows that patients treated primarily by surgery, supplemented by external radiation, or radiation by means of radium in the operative cavity, have a better than a 2 to 1 chance of a 5 year survival than those treated primarily by radiation. JOHN F. DELPH, M.D.

MOUTH

Recurrent Epithelioma of Lip. PERCIVAL P. COLE. *Brit. J. Surg.*, 1948, 36: 79.

The author reports the case of a stoker, aged 28, who was referred as a prisoner of war from the Royal Herbert Hospital. In 1939, he had cut the right side of his lower lip while shaving, and an ulcer formed which did not heal. The man was treated with radium irradiation, in Belfast.

In October, 1941, two years after treatment, a recurrence was noted, and in March, 1942 he was admitted to the Royal Herbert Hospital. A biopsy taken there showed the growth to be an epithelioma. Wassermann and Kahn reactions were negative.

At this time the author observed a deep ulcer with raised edges, measuring 1 cm. by 1.5 cm., extending just to the mucocutaneous junction, and involving the lower lip and a corresponding area of the angle of the mouth. There was considerable surrounding induration but no fixation to bone. The right submaxillary gland was enlarged.

The adopted method of reconstruction makes impracticable the approach to the anterior triangle by the usual incisions. The somewhat irregular line tracing the incision along the lower border of the jaw, at the base of the anterior triangle, divides the area of operation into two parts. In the lower part is the anterior triangle with apex downwards. Free access to its contents is obtained by the reflection of skin flaps posteriorly and anteriorly from an incision joining its apex below, to a point roughly midway along its base above.

Operation was performed on May 2, 1942. Gas and oxygen were administered by intubation. The lower area was isolated from the face and mouth, and a block dissection undertaken.

Adequate exposure was obtained without removal of the sternomastoid and the jugular vein so that, in this particular case, the technique of Butlin was employed in preference to that of Crile. After clearance of the area the skin flaps were united by suture, with dependent drainage at the lower angle of the wound. Following isolation of the area thus dealt with, the malignant ulcer, with a wide margin of surrounding tissue comprising the whole thickness of lip and adjoining cheek, was excised.

It is essential for success in this direction that the mucous membrane be defined and sufficiently freed to be dealt with as a separate layer. Incision of this layer upward and forward increases the length of the lower border of the mucosal flap and so permits it to reach to the midline, if necessary, there to secure mucosal closure by suture to the corresponding layer of lip, or to a corresponding flap from the other side if the whole lip has been removed.

This method of treatment, first reported in *Lancet*, 1920, 2: 845, has been adopted as the standard technique for reconstruction of the lower lip. It is believed to be the best method for cases in which the lesion involves the angle of the mouth and encroaches upon the cheek to a limited extent. For obvious reasons, direct borrowing should be preferred to remote transfer of tissue in such cases, but the choice can only be made after a careful survey of conditions present in the individual case.

In conclusion, the author states that epithelioma of the lip is encountered most frequently after the age of 50 years. Its occurrence at the unusually early age of 28, in the author's experience, was associated with a breach of surface occasioned by a wound or burn. War wounds by bullet or shrapnel have been responsible factors in several such cases, and it is noteworthy that malignancy supervened a very short time after their infliction. The same rapidity of onset is demonstrated in the present case.

Whatever the view that may be taken of the mode of treatment to be adopted for a primary lesion, the author believes that recurrence after irradiation, computed to be adequate, is unquestionably an indication for surgical intervention. In this connection the surgeon would do well to remember the pernicious behavior of tissues in which permanent obliterative vascular changes have resulted from irradiation. In order to secure normal behavior and to eliminate, as a preliminary to success, a factor whose effect cannot be assessed or compensated for, it is advisable to remove the whole area subjected to irradiation, as was possible in the present case.

The possibility of failure and the resulting compulsory resort to surgery constitutes a strong argument in favor of methods which secure intensive localized irradiation in preference to those which employ irradiation on a more diffuse scale. It is indeed a question whether initially the surgical approach should not be preferred to the radiotherapeutic approach. The article is accompanied by 5 figures and 4 photographs.

JOHN F. DELPH, M.D.

NECK

Trial Classification of Malignant Thyroid Tumors (Essai de classification des tumeurs thyroïdiennes malignes). JOSEPH F. MARTIN, M. DARGENT, and P. GUINET. *Ann. anat. path.*, Par., 1947, 17: 306.

Clinical experience demonstrates the value of distinguishing between cancers with a structure recalling more or less the original thyroid structure and cancers which have kept nothing of the normal type of thyroid structure; therefore, the authors have used the classical criterion of tissular atypism, but, for general reasons, have preferred to adopt the orthoplastic, anaplastic and metaplastic qualifications. However, the surprising mimetism of the thyroid cell does not allow this simple distinction to include the great variety of neoformations, and various groups must be individualized, especially in orthoplastic cancer. Each of them is easily defined by its histologic characters, but it is advisable not to attach absolute importance to the differentiation of these secondary morphologic and cytologic types, since mixed tumors may be seen with the characters of two or three variants on the same slide or in different fragments. However, the histologic tests which define the orthoplastic, metaplastic, and anaplastic forms are strict enough to make it possible to put each tumor in its proper place. The proposed classification is as follows:

1. Epithelial tumors.

a. Orthoplastic forms may be observed as; (1) vesicular epithelioma, with conservation of the cellular grouping into vesicles, but malignancy is revealed by pluristratification, rupture of the basal layer, and cellular changes; (2) papillary epithelioma, with arborescent proliferations centered on a connective tissue axis inside each vesicle; and (3) trabecular epithelioma (a) trabeculovesicular epithelioma with small dark cells (proliferating struma of Langhans), (b) epithelioma with large eosinophile cells, and (c) epithelioma with clear cells.

b. Anaplastic forms: characterized by structural anarchy and cellular indifferentiation with frequent monstrosities. There are nearly always necrotic zones. The more or less marked stroma reaction allows persistence of large groups of cells or insinuates itself between the neoplastic elements to wall them off in varying manners.

c. Metaplastic forms: (1) epidermoid type: Herrenschmidt's cancer; and (2) connective tissue type, touching the question of epitheliosarcoma.

2. Connective tissue tumors. They are rare: (1) fibrosarcoma; (2) lymphosarcoma and plasmocytosarcoma; and (3) reticuloendothelial tumors: reticulosarcoma, histocytosarcoma, and hemangioendothelioma.

In some cases it is possible to see phenomena of differentiation of the fundamental substance with skeletogenous metaplasia of the stroma.

It might be astonishing not to find in this enumeration the so-called metastatic adenoma. This is really a slightly peculiar symptomatic form which, through strict clinical and histologic analysis, can usually be referred to a definite type of cancer, such as tumor of the aberrant thyroid, cancer with slow evolution, or cancer with a very localized histologic onset. The few cases in which this does not apply are solved by the notion of latent and adenomorphous epithelioma, a form in which the malignant hyperplasia is masked under vesicular or trabecular adenomatous conditions. It is in such cases that the malignancy tests acquire their full value (spreading beyond the capsule and vascular invasion).

RICHARD KEMEL, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

A Method of Contrasting Visualization of Brain Abscesses (Ueber eine Methode zur Kontrastdarstellung von Hirnabscessen). HANS KOLMER. *Chirurg*, 1948, 19: 247.

The author suggests the roentgenological visualization of brain abscesses by puncturing them and injecting uroselectan (similar to diodrast) into them. This procedure is either preceded or followed by encephalography or ventriculography.

The author claims that this method would be of help in evaluating the position and the size of the abscess, its relation to the ventricle and the cortex, and in determining its operative approach.

GEORGE PERRET, M.D.

SPINAL CORD AND ITS COVERINGS

Lumbar Herniations of the Nucleus Pulposus. An Analysis of 196 Operated Cases. E. S. GURDJIAN and JOHN E. WEBSTER. *Am. J. Surg.*, 1948, 76: 235.

The authors' report is based upon a study of 196 patients seen in the 6 year period from 1940 to 1946, and having as their main complaint low back pain with sciatic radiation. All of the patients were operated upon and an analysis of the underlying pathologic changes is presented.

A single ruptured or protruded disc was found in 146 patients. Two herniated discs were found at separate interspaces in 9 patients—usually at the fourth and the fifth lumbar interspaces. Eight patients had a massive rupture of the disc. A calcified disc was found in 5 patients. In 28 of the patients no disc protrusion could be seen. A study of the 28 patients without disc protrusion revealed the underlying condition to be varicosities of the outgoing nerve root in 12 cases; root compression by continuous tissue in 7 cases; and herniation of a cauda equina filament through a dural opening in 1 case. No disc protrusion could be made out in 8 cases. The varicosities were thought to be typical epidural hemangiomatous tissue.

The spinal fluid was examined in all cases, and in the majority a slight elevation of the total protein to about 50 mgm. per cent was revealed. In only 4 cases was it above 100 mgm. per cent; however, it is not mentioned whether this pertained to the proved cases of herniated disc or included some of the other cases with unverified pathologic changes.

Myelography was carried out on 31 patients. An error of 25 per cent to 30 per cent was found, including both the false positive and the false negative. Nevertheless, it is felt that myelography is worth while, particularly in doubtful cases, in order to rule out the possibility of either multiple lesions or a neoplasm.

X-ray examination is considered an important adjunct in the diagnosis to rule out the presence of either sacroiliac arthritis, spondylolisthesis, lumbar spinal arthritis, Marie-Strumpell disease, metastatic lesions of the lumbar spine, tuberculosis, or sacral chordoma. The authors, however, emphasize that a ruptured or protruded disc may coexist with spinal arthritis, sacroiliac arthritis, iliac osteitis, and spondylolisthesis. A narrowed intervertebral space does not necessarily indicate the level of a ruptured disc.

The pathologic changes of the intervertebral disc were divided into the following four categories: (1) a bulge or protrusion of the nucleus through a weakened but intact portion of the posterior longitudinal ligament; (2) a rupture of the nucleus through a tear in the annulus and the posterior longitudinal ligament; (3) a degenerating nucleus and annulus fibrosis causing reflex pain but not being associated with an actual protrusion of the disc; (4) rupture of the nucleus into the bodies of the adjacent vertebrae, resulting in the commonly known Schmorl's nodes.

The symptomatology may be quite variable and may or may not be associated with neurologic signs. The main complaint is low back pain with radiation of pain down the sciatic distribution. The pain is usually aggravated by coughing, sneezing, or straining at stool; however, occasionally this aggravation of pain may not be present. Oftentimes the backache precedes the sciatic pain by months or years, but again they may have a simultaneous onset and occasionally may have only the sciatic pain. The examination usually elicits pain on straight leg raising. Pain may be aggravated by compression of the neck veins or by forward flexion of the head and neck, and by bending backward or toward the lesion. Percussion at the level of the lesion usually produces typical radiation of pain. The knee jerk may be lost with a disc at the third interspace. A disc at the fourth interspace may result in weakness of the extensor hallucis longus and hypalgesia along the lateral aspect of the leg and over the big toe. A disc at the fifth interspace is frequently associated with a diminished or absent ankle jerk, and a mild sensory deficit along the lateral three toes and the corresponding portion of the foot. Severe neurologic signs such as foot drop, saddle anesthesia, and sphincter disturbances are associated with massive ruptured discs at either the fourth or fifth interspace.

The operative procedure usually consists of a partial hemilaminectomy with excision of the ligamentum flavum and the ruptured disc with curettement of the interspace. In patients with severe neurologic disturbances a bilateral laminectomy is usually performed. The fourth and fifth interspaces are routinely inspected in all cases. A spinal fusion was performed by an orthopedic colleague in 28 cases by the use of a massive tibial graft. The decision to perform a spinal fusion was based upon the presence of

a spondylolisthesis, unstable fifth lumbar vertebra, or a long history of backaches. It is interesting to note that the fusion was usually performed only on one side—the side opposite to the removal of the disc.

The results of treatment were classified as follows: Excellent—a complete recovery; good—marked improvement with ability of the patient to return to work; fair—improved but with definite residual discomfort; and poor—unimproved and not able to work. Forty-three per cent of the patients obtained excellent results, 25 per cent obtained good results, 20 per cent fair, and 12 per cent, poor results. An interesting and important finding is that the results in those cases in which operation was combined with a spinal fusion were apparently no better than those in which only a small hemilaminectomy with the removal of the disc had been done.

JACK I. WOOLF, M.D.

PERIPHERAL NERVES

Causalgia Following Gunshot Injuries of Nerves. JAMES C. WHITE, WILLIAM H. HEROY, and EDMUND N. GOODMAN. *Ann. Surg.*, 1948, 128: 161.

The authors discuss the clinical picture of causalgia, its etiology and treatment, and present the case histories of 13 patients observed in a Naval Hospital. In their opinion the term "causalgia" should be limited to include only the sequelae of penetrating wounds of the extremities which cause injury to the nerve trunks, and the triad of (1) burning pain in the hand or foot, (2) trophic changes in the skin, subcutaneous and bony structures, and (3) autonomic phenomena such as excessive vasomotor and sudomotor activity. This syndrome occurred 13 times in some 400 patients with peripheral nerve wounds, representing a rate of incidence of slightly over 3 per cent. In their case histories, the authors emphasize the immediate occurrence of symptoms in these patients after the injury, the importance of thermal and emotional factors on aggravation of pain, and the effectiveness of adequate sympathectomy for its relief.

Although many aspects of the causalgic syndrome suggest that it is a form of psychoneurosis, the immediate relief of symptoms following proper surgical treatment indicates that the personality disturbance is a result rather than the cause of an endurable condition. The immediate occurence of the syndrome after injury eliminates sepsis, ascending neuritis, anoxia, compression of the nerve by scar tissue, or the formation of a neuroma as etiologic factors. Injury to a major blood vessel was present in only 3 of 13 patients.

It was found that a quiet, warm environment, ingestion of alcohol, sleep, and afebrile states increased the comfort of these patients. Questioning of the patients revealed that the burning pain and hyperesthesia were aggravated by cold, damp, or very hot weather, cold air on the affected hand, loud or unexpected noises, annoying radio programs, jarring of the bed, excitement, harrowing movies or stirring music, crying children, hypodermic injections into any part of the body, arguments with other patients, physical exertion, defecation and urination, drinking anything cold, and laughing. The single common denominator which underlies these diverse irritants was a burst of sympathetic impulses emitted from the hypothalamus and causing vasomotor, pilomotor, and sudomotor responses in the hand and fingers, and in the toes and soles of the feet. These areas show the greatest evidence of autonomic activity and produce nervous sweating and vasoconstriction. There is no valid evidence that the sympathetic system plays any direct role in the central conduction of painful stimuli. It is, therefore, the authors' contention that the hyperesthetic state is caused and aggravated by autonomic impulses released at the hypothalamic level in response to thermal and psychic stimuli, and distributed over efferent sympathetic neurones permitting a direct irritation of sensory afferent fibers at the site of nerve injury.

Total sympathetic denervation of a limb is an effective method for the relief of true causalgia. Failure in producing complete relief of pain is due to incomplete sympathetic denervation. It is emphasized that the area of denervation must reach well above the level of nerve injury. If there is temporary relief of pain following a diagnostic procaine block, the patient should be operated upon at an early date before he has become dependent on narcotics, and especially before he has developed neurotic tendencies or irreversible atrophic changes in his bones and soft tissues. Preliminary neurolysis is totally ineffective and, if indicated, should be undertaken after the sympathectomy. Primary local surgery is recommended only if a foreign body is in contact with the nerve, or when a septic focus is present.

In 4 patients a complete paralysis of a neighboring nerve trunk was also present; after sympathectomy, vasodilation was complete only in the area of intact peripheral nerve supply and the adjoining paralyzed areas remained cooler and somewhat cyanotic, possibly due to hypersensitivity of the denervated smooth muscles to sympathomimetic hormones. The paresthesias and milder hyperesthesias which accompany sensory nerve regeneration are not necessarily relieved by sympathectomy. These latter symptoms are mild and not influenced in any way by hypothalamic stimulation and increased sympathetic discharges.

GEORGE PERRET, M.D.

The Role of Foreign Body Reaction in the Healing of Peripheral Nerve Injuries Due to Gunshot Wounds (Zur Frage der Heilung schussverletzter peripherer Nerven mit besonderer Beruecksichtigung der Haeufigkeit und Bedeutung der Fremdkoerperentzundung). EDMUND RANDERATH. *Chirurg*, 1947, 17–18: 241.

The author found that functional results were often poor following gunshot injuries of the periph-

eral nerves because of inflammatory processes and an increase in the amount of scar tissue resulting from foreign bodies. He studied the operative material obtained from 950 peripheral nerve lesions due to bullet or shrapnel wounds, from 2 to 44 months after the injury. He found foreign objects imbedded in the nerve scar in 485, or 51 per cent, of the cases. Even after 20 months an active inflammatory process could be found around foreign material and scar tissue within the nerve segments. The most common foreign bodies were particles of clothing, plant fibers, wood splinters, earth particles, and stone and bullet fragments. Oftentimes the foreign body reaction with increased production of scar tissue was caused by bandage or suture material. The foreign bodies were most frequently encountered in wounds produced by shrapnel fragments and were relatively rare in direct bullet wounds.

GEORGE PERRET, M.D.

SYMPATHETIC NERVES

Temporary Interruption of the Sympathetic Impulses to the Head by Infiltration of the Cervical Sympathetic Trunk. HOMER D. KIRGIS and ADRIAN F. REED. *Ann. Surg.*, 1948, 128: 101.

The value of a transient interruption of the sympathetic impulses to the upper extremity and the head is now well recognized both therapeutically and in prognosticating the reaction to surgical interruption of these pathways. The more commonly accepted procedure of injecting or infiltrating about the cervicothoracic ganglion is a very satisfactory procedure and comparatively benign. However, there are several potential complications which must be considered. These include the possibility of puncture of the apex of the lung, injury to the brachial plexus, and puncture of the large vessels of the lower portion of the neck. In blocking the sympathetic impulses to the head, a much simpler procedure would be to inject the sympathetic trunk at the level of the tuberosities of the fifth or sixth cervical transverse processes.

In order to elucidate this problem, the authors performed a dissection of the sympathetic trunk on 33 cadavers. It was found that at the level of the fifth and sixth cervical vertebrae the sympathetic trunk lies on the longus colli muscle, medial and slightly anterior to the fibers of the scalenus anticus muscle, in a small compartment formed by a splitting of the prevertebral fascia. It is posteromedial to the carotid sheath and its contents. The constant relationship of the sympathetic trunk and its proximity to the easily palpated carotid tubercle and the anterior tuberosity of the transverse process of the fifth cervical vertebrae makes this a uniformly successful approach.

The technique advocated is to have the patient assume the supine position with the head flexed and turned slightly to the opposite side. This permits easier palpation of the tuberosities of the transverse processes of the fifth or sixth cervical vertebrae and permits easier retraction of the carotid sheath and its enclosed vessels medially. In a slender person a small hypodermic needle may be used throughout; however, in a heavier individual a 21 gauge venous puncture needle will suffice. The needle is usually inserted along the posterior border of the sternocleidomastoid muscle (which is retracted medially with the carotid) and is then advanced until it is in contact with the lateral surface of the tip of the transverse process. After withdrawing it slightly, it is reinserted along the anterior surface of the tuberosity. At a depth of approximately .5 cm. from the lateral extent of the transverse process the injection is performed. Although the possibility of entering the intervertebral foramen is extremely slight, nevertheless it is mandatory that aspiration be performed before the solution is injected. The injection may be performed by retracting the sternomastoid muscle and the carotid sheath laterally; however, this produces more discomfort to the patient. A successful block is usually obtained after 3 to 5 c.c. of a 1 per cent solution of procaine hydrochloride has been injected, although it may be necessary to inject up to 8 or 10 c.c.

The authors have used this technique approximately 350 times with satisfactory results. There have been no significant sequelae; however, a patient may complain of slight pain on insertion of the needle, or hoarseness due to infiltration about the recurrent laryngeal nerve. Repeated injections, however, resulting in increased vascularity with hypertrophy of the lymphoid tissue, may slightly complicate a future surgical procedure on this portion of the sympathetic trunk. JACK I. WOOLF, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Breast Tumors with Local Malignancy. Giant Fibroadenomas, So-called Phyllode Adenomas, and Recurring Adenomas (Les tumeurs du sein a malignité locale; fibro-adénomes géants, adénomes dits phyllodes et adénomes récidivants). P. SANTY, M. DARGENT, and A. MAKHLOUF. *Lyon chir.*, 1948, 43: 304.

Eight cases of breast tumor are reported. The largest of the enucleated tumors weighed 2,700 gm. The rapid growth, skin ulceration, progressive enlargement during menstruation and pregnancy, and frequent recurrences after extirpation—up to seven times in one case—in these cases simulated cancer. However, the absence of regional adenopathy and of metastases in other organs, as well as the absence of cachexia, proved that the tumor was only of local malignancy, not a true carcinoma or sarcoma. It is characteristic of these tumors that they reach a very large size, one weighing 7,500 gm. being recorded.

Although carcinomatous degeneration of fibroadenomas is rare, treatment with androgenic or estrogenic hormones may be dangerous and is contraindicated.

WERNER M. SOLMITZ, M.D.

The Prognostic Significance of Early Diagnosis in Breast Cancer. SIGVARD KAAE. *Acta radiol.*, Stockh., 1948, 29: 475.

This study is based on 500 cases of breast cancer and Paget's disease of the nipple seen at the Radium Center in Copenhagen between June, 1944 and December, 1946. These were all verified histologically except one which was clinically unmistakable and the patient died with metastases.

There were 17 cases of Paget's disease of the nipple, in 12 instances associated with a carcinoma. Two cases of sarcoma of the breast were seen. There were 5 cases of carcinoma of the male breast. Among the 476 other cases, there was 1 patient who had had a breast tumor for 46 years so the factor of delay could not be accurately appraised and she is excluded in the final analyses.

The author personally interrogated the subjects included in the statistical series. The cause of delay in seeking medical advice after recognizing signs or symptoms of breast cancer was essentially ignorance of the possible gravity of the situation or fear that an unfavorable diagnosis would be rendered upon examination. The delay in coming to adequate treatment was sometimes the patient's fault, but also at times due to lack of energetic action on the part of the examining physician.

The significance of such delay has long been recognized and can be appreciated in the accompanying table, which illustrates the relation between delay and operability and between delay and the stage of disease when appropriate treatment was actually instituted. In this table cases in stage I are those without demonstrable axillary metastases and those in stage II are those with demonstrable axillary metastases.

TABLE I.—SHOWING THE RELATION BETWEEN DELAY AND OPERABILITY, AND BETWEEN DELAY AND STAGE OF DISEASE WHEN TREATMENT WAS INSTITUTED

Delay	No. of cases	Technically operable	Radically operated on, in ratio of technically operable	Cases in stage I in ratio of number operated on	All cases		
					Stage I	Stage II	Inoperable
		Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
2 Weeks or less	84	100	92	59	59	41	0
2 Weeks—1 Month.	69	94	95	56	53	41	6
1—3 Months	92	89	87	48	43	46	11
3—12 Months	140	77	77	40	31	46	23
Over 12 Months	90	71	78	58	41	30	29
Total	475	85	85	51	44	41	15

The increase in cases in stage I occurring with a delay of over 12 months is presumed to be due to a greater number of slow-growing, late metastasizing tumors in this group. The cause for nonoperative treatment in the technically operable group was either refusal by the patient, advanced age, or severe intercurrent disease. Education is believed to have already produced results, but the author concludes, "What is gained prognostically by the patient seeking medical advice early ought not to be lost by failure to have the diagnosis established at once."

HIRAM T. LANGSTON, M.D.

TRACHEA, LUNGS, AND PLEURA

Parietal Complications of Collapse Therapy (Complications pariétales de la collapsothérapie). A. BERNOU, R. GOYER, and L. MARÉCAUX. *J. fr. méd. chir. thorac.*, 1948, 2: 301.

Patients who have undergone thoracoplasties often suddenly develop a serious pleural complication followed by infection of the thoracic walls. This complication may occur a long time after the operation. According to some statistics, as many as 80 per cent of such patients die of the complication.

The authors had the same experience in their practice until they began to use forced aspiration, and at a time when penicillin was unknown.

They have been able to bring about cures by evacuating the pus with simple pleural punctures, with or without the insufflation of air or lavage, or without

producing an oleothorax. They report cases in which the patients were cured by these simple means.

Not all abscesses are due to tuberculosis. The septic abscesses respond well to the sulfa drugs and to the antibiotics. Three of the authors' patients were successfully treated with penicillin; all of these had a large abscess of the chest wall following thoracoplasty.

Tuberculous abscesses of the thoracic wall still constitute a grave complication of collapse therapy. They may remain localized for a long time, but they often pursue a progressive course, spreading according to gravity, from above downward most often, but at times backward if the patient is confined to bed. They may spread out from a pleurotomy opening, following the intercostal spaces, or even spread in the most diverse directions, forming the most unexpected fistulous tracts. These tracts are capable of giving rise to suppurative mediastinitis, caseous mediastinal adenopathies, esophagopleural fistulas, ulceration of the great vessels (e.g., the subclavian artery), areas of costal osteitis (vertebral or sternal), and caseous pleurisy.

Whenever possible, the abscess, even a very large one, should be removed *in toto*. After complete removal of the abscess, plastic repair of the defect should be carried out. If one finds a fistulous tract at the bottom of the wound in the course of surgical intervention it should be thoroughly removed and the caseous area should be thoroughly cauterized. Treatment with penicillin should then be instituted.

In the case of multiple tracts in varied directions, it may be impossible to remove them all even by total ablation. This is true particularly when the tracts extend into the scapula. The therapeutic result will be incomplete and followed by recurrence.

Before employing surgery, one should always try the sulfa drugs, or better, penicillin. One will be surprised to see the abscesses promptly disappear.

When medical treatment has failed and forced aspiration has proved unsatisfactory, a well planned surgical procedure is necessary.

BLACKWELL MARKHAM, M.D.

Pulmonary Decortication for Chronic Posttraumatic Hemothorax; Constricting Pleura (La décortication pulmonaire pour hémothorax post-traumatique chronique; plèvre constrictive). A. P. NAEF. *Helvet. chir. acta*, 1948, 15: 190.

Chronic organizing hemothorax, infected hemothorax, and hemothoracic empyema are dangerous posttraumatic sequelae. The time when these disorders were treated by mutilating thoracoplasties of the Schede-Estländer type is now gone. Decortication and total pulmonary mobilization alone allow satisfactory healing and nearly complete restitution of functional integrity. This operation, which was already performed toward the end of the past century, has been adopted and improved by the Anglo-American war surgeons. Modern decortication was performed for the first time by Burford in May, 1943, and more than 1,500 operations have been done since then with excellent results and a mortality below 2 per cent. However, this impressive result should not obscure the fact that decortication is a serious intervention which, like any modern type of intrathoracic surgery, requires definite conditions for its success.

Successful decortication in a few isolated cases of chronic or subacute purulent pleurisy has again demonstrated the importance of obliteration of the empty pleural space by re-expansion of the lung to avoid eventual pleural suppuration. This can be compared with the capital role played by immediate pleural obliteration after partial pulmonary resection. It is impossible to overemphasize the importance of re-expansion of the remaining pulmonary parenchyma to avoid postoperative empyema.

Some technical details are very important. The epipleural plane of cleavage must be established exactly to allow blunt dissection without tearing of the intact visceral pleura, and during dissection the pressure must be exercised toward the shell and not toward the pulmonary surface. A pulmonary segment or an entire lobe may be in exceptionally bad condition and pulmonary segmental resection or lobectomy may be necessary. The whole lung, from apex to diaphragm, on the mediastinal side and at the fissures, must be liberated, and the parietal surface of the diaphragm must also be decorticated and the costodiaphragmatic and cardiophrenic sinuses developed. This will allow circumferential re-expansion of the lung in all directions. In general decortication of the parietal pleura is not recommended because it causes hemorrhage which is difficult to stop. Several intercostal drains are used and connected to a strong and continuous aspiration apparatus. If there is no intrapleural suppuration, the drains are removed as soon as the lung adheres to the chest wall, between the second and fifth days. Positive pressure respiration with an anesthesia apparatus during the first postoperative days is very useful. Penicillin given by the general route, by aerosol inhalation, and by intrapleural irrigation offers valuable protection. Voluntary exercises of unilateral respiration, intense thoracic gymnastics, and relatively early ambulation are essential factors in the recovery of patients with thoracic injury. RICHARD KEMEL, M.D.

An Improved Method of Resection of Pulmonary Segments. RICHARD H. OVERHOLT, FRANCIS M. WOODS, AND REEVE H. BETTS. *J. Thorac. Surg.*, 1948, 17: 464.

The development of the concept of the lung as a segmental organ is briefly traced and the importance of preserving at operation the healthy portions of lung is emphasized. The technique developed by various other authors is described. Since the present authors found certain objectional features in these methods, they evolved a technique to overcome them.

Each bronchopulmonary segment is provided with a bronchial and arterial supply and a venous return, all of which are consistent in pattern. The artery, vein, and bronchus form the segmental hilum. These

structures and the pleura covering the segment are the important elements binding one segment to its neighbor. The intersegmental surfaces within a lobe of lung are made up of a loose areolar plane. The arterial and bronchial supply does not, typically, cross this intersegmental plane, although a few venous channels may.

In segmental resection, the arterial and venous channels at the segmental hilum are divided accurately. The segmental bronchus is then isolated, clamped, and divided proximal to the clamp. The stump is closed with interrupted sutures tied over the end. With traction on the distal stumps of the divided hilar elements, the segment in question is stripped from its neighbor. This maneuver is aided by digital or gauge dissection along the intersegmental plane. This line of demarcation is determined by differential inflation under increased intrabronchial pressure supplied by the anesthetist, wherein the intact adjacent segment will freely aerate in contrast to the atelectatic segment undergoing resection. The pleura is finally divided when it is reached by this dissection.

No special treatment is required for the intersegmental plane since there will be no significant air leak if an accurate separation has been done. A few intersegmental veins may require ligation.

This method has been used in 70 segmental resections in various combinations. Fifty-nine resections were carried out on 50 patients for bronchiectasis and 11 were done for other indications. In the bronchiectatic group there were 6 additional total lobectomies. The patients ranged in age from 7 to 55 years. The nonbronchiectatic indications included tuberculosis, chronic lung abscess, pulmonary cyst, benign tumor, and metastatic tumor.

The only death occurred as the result of a hemopericardium produced by perforation of the pulmonary artery by a stainless steel wire suture used to close the bronchus. This suture material is no longer used. There were empyemas in 23.7 per cent of the 59 patients resected. Reoperation because of persistent pneumothorax was required three times. The segmental surface was responsible for this situation in 2 instances and the bronchial stump once. Whereas the complications are greater than in total lobectomy, the conservation of lung tissue is believed to compensate adequately for this. The end-results have been entirely satisfactory.

The text is supplemented by many semidiagrammatic illustrations. HIRAM T. LANGSTON, M.D.

HEART AND PERICARDIUM

Dysphagia Lusoria: Right-Sided Aortic Arch. W. N. MANN. *Guy's Hosp. Rep.*, Lond., 1948, 96: 186.

The term "dysphagia lusoria" means dysphagia from a "sport" of nature and has been used to describe examples of pressure on the esophagus from a right aortic arch.

The location of the aortic arch on the right side is a rare congenital anomaly, Maude Abbott having found only 14 examples in 1,000 cases of congenital heart disease. Three varieties have been described. In the first type, which is not common, the right fourth arch persists to form the aorta, while the fourth left arch persists to form the left subclavian artery, which passes across in front of the esophagus and trachea. The second variety is the most common. Here the right fourth arch persists to form the aortic arch with the right dorsal aortic root. The left fourth arch disappears or is represented by a fibrous band, but the left dorsal aortic root persists and is joined to the left pulmonary artery by the ductus arteriosus and gives origin to the left subclavian artery. Because this "persistent left root" is dorsal in position, the left subclavian artery arises posteriorly and does not lie in front of the esophagus and trachea. Through the attachment of the persistent left root to the ductus arteriosus and the left subclavian artery, the "right" or definitive aorta is pulled to the left behind the esophagus. The esophagus is thus displaced forward and to the left, and its lumen partly occluded by pressure from the diverticulum.

The third variety, which is very uncommon, is persistence of both the left and right fourth arches with both dorsal aortic roots so that the esophagus and trachea are enclosed in an arterial circle.

Symptoms from uncomplicated right aortic arch are unusual. When present they may be dysphagia, paresthesias in the left arm, or dyspnea. Symptoms are more severe in cases of double aorta.

The author describes the case of a 37 year old woman who was studied because of difficulty in swallowing. Roentgenological studies showed the esophagus to be pushed forward and to the left. The right border of the great vessels was unusually prominent and curved toward the right. On the left, in the position of the aortic knuckle, was a triangular shadow which was taken to be the blind end of the dorsal remnant of the left aortic arch. Tomography showed a connection between the persistent left aortic root and the left pulmonary artery, the ligamentum arteriosum. The interpretation is that this patient suffered from right-sided location of the aorta of the second type described. She was relieved of her symptoms by simple conservative measures without operation. JESSE E. THOMPSON, M.D.

ESOPHAGUS AND MEDIASTINUM

The Surgical Treatment of Carcinoma of the Thoracic Esophagus. LYMAN A. BREWER, III, and FRANK S. DOLLEY. *West J. Surg.*, 1948, 56: 517.

This article is a report of 30 proved cases of carcinoma of the esophagus, in 23 of which thoracolaparotomy was done. Twenty-two of the cancers were located at, or just below, the arch of the aorta. Eight were just above the diaphragm. Diagnosis is made on the history of dysphasia, usually progressive but sometimes with periods of remission. Frequently there was regurgitation of food, as well as loss of weight and strength. A clinical picture of starvation

is the outstanding physical finding. Roentgenological examination and esophagoscopy confirm the diagnosis. Pathologically, squamous cell carcinoma (65 to 95 per cent) and adenocarcinoma (5 to 30 per cent) are found. Approximately 20 per cent of these lesions are located in the upper third of the esophagus, 37 per cent in the middle third, and 42.8 per cent in the lower third. Local spread to adjacent organs and lymph node metastases are of prime importance. Lesions at the arch or above spread to the trachea, bronchi, aorta, and mediastinum. Lymphatic spread is to the mediastinal nodes primarily, although the cervical nodes are sometimes involved. In association with some lesions in the midthoracic esophagus, subdiaphragmatic lymph node metastases are seen. Thus a combined thoracoabdominal approach is advisable. The contraindication is definite evidence of extensive spread of the tumor, most commonly to the mediastinum.

The author describes his method of preoperative preparation and several methods of treating these lesions. His technique consists of an S-shaped incision at the level of the fifth rib posteriorly and extending down to the seventh rib and on to the abdomen. The mediastinum is explored for metastases and evidence of inoperability, and the diaphragm is operated upon after the phrenic nerve is crushed. The stomach is then freed, care being taken with the main branch and anastomotic arches of the gastroepiploic artery. The right gastric artery is identified and preserved. The remainder of the esophagus is then mobilized, care being taken not to injure the thoracic duct. After novocain injection, the vagi are cut. For high anastomosis the esophagus is divided at the cardia. However, in lower lesions, a portion of the stomach may have to be removed. The esophagus is then pulled up behind and above the arch of the aorta. Open anastomosis between the esophagus and the stomach is done with a layer closure of interrupted fine silk sutures. The fundus is used for the anastomosis, a ring 2 cm. in diameter being used. The anastomosis is reinforced by the gastrocolic omentum which had been previously saved. The Levine tube is kept proximal to the anastomosis. The stomach is tacked to the parietal pleura from the arch of the aorta to the diaphragm. The chest is closed with catheters inserted, and "under-water" closed drainage is used. The patient is allowed to swallow water after a period of about 48 hours.

The importance of postoperative thoracic complications is emphasized. Two of the patients in this series developed wound infection which responded promptly to drainage. The 2 operative fatalities occurred following resection above the arch of the aorta. Both of the patients had arteriosclerotic heart disease and auricular fibrillation. In this series 23 of 30 were explored and only 9, or 36 per cent, were subjected to resection. The authors point out that the risk of transthoracic laparotomy in properly prepared patients is very small. Recently they have used postoperative supravoltage roentgen therapy over the areas previously involved with cancer in cases of squamous cell carcinoma. It is too early to state whether or not this treatment will increase the length of cure following operation.

ROBERT E. FLORER, M.D.

Esophageal Resection with Intrathoracic Esophagogastrostomy for Carcinoma in the Middle Third of the Esophagus (Carcinoma do esôfago médio-torácico. Esofagectomia parcial e esôfago-gastro-anastomose intra-torácica.) HAROLDO A. RODRIGUES. *Rev. brasil. cir.*, 1948, 17: 51.

This is a very detailed case report of a 57-year-old white man whose presenting complaints were dysphagia and vomiting of 3 months' duration. An obstructing lesion of the esophagus was found on roentgenographic examination. No biopsy was obtained. On May 20, 1948 an exploratory thoracotomy revealed an esophageal tumor 5 by 3 cm. in size, which was located 8 cm. above the diaphragm. The esophagus was resected. The stomach was mobilized and an esophagogastric anastomosis was performed just below the aortic arch. The chest was closed with drainage. The lesion was a squamous cell carcinoma. Regional nodes were removed along with the esophagus and these were found to contain metastasis. The patient survived the procedure without significant complications.

The author traces the development of the present day technique of management in carcinoma of the esophagus and points out that this was the first successful resection for a lesion in the midesophagus performed in Rio de Janeiro.

During the first 10 days after operation the patient was kept in a head-down position. This was thought to favor evacuation of the tracheobronchial secretions, prevent the swallowing of pharyngeal secretions, avoid pendant traction on the line of anastomosis, and improve the peripheral circulation. Mouth feeding was withheld for 10 days. The closed drainage tube from the pleura was removed on the eleventh day. A course of deep roentgen therapy was given to the mediastinum.

HIRAM T. LANGSTON, M.D

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Contribution to the Study of Strangulated Inguinoproperitoneal Hernia (Contributo allo studio delle ernie inguinoproperitoneali strozzate). ARMANDO BIASINI. *Rass. internaz. clin. ter.*, 1948, 28: 231.

The author reviews his experience with 3 cases of inguinoproperitoneal hernias which are considered of rare occurrence, and which represent 0.31 per cent of the hernias encountered at his clinic.

The characteristics of this type of hernia are presented. Such hernias may be composed of a single sac situated between the transversalis fascia and the peritoneum, and always in the vicinity of the inguinal region, or they may possess two sacs, one external-inguinal, the other internal properitoneal. There are three varieties: (1) iliac, when the sac is lateral and superior to the inguinal ring and thus in the iliac fossa; (2) vesical, when the sac is situated medial to the ring and near the urinary bladder; (3) pelvic or obturator, when the sac is situated between the peritoneum and the pelvic wall near the obturator foramen. When two sacs are present they may have a common abdominal opening, or the openings may be distinctly separate although, usually, close together. The opening is usually surrounded by rigid fibrous tissue. The size of the sac varies from that of a small nut to that of a fetal head, or larger. The contents may be small bowel and omentum, or omentum alone. The alterations following strangulation, are caused by the action of the ring, represented by the abdominal ostium.

Of the 3 hernias seen by the author, 2 showed strangulation, and one of these was treated by resection. In both cases the sac was first opened by a rectus incision. After the hernia was reduced and the internal ring closed, a regular Bassini repair was resorted to in the case not requiring bowel resection. The third case was complicated by small bowel perforation and abscess formation. A resection was performed, with excision of as much of the sac as possible; three layers of suture were used. The abdominal wall was then closed in layers. After a stormy convalescence the patient recovered and was discharged. A few days later (21 days after operation) he returned with a recurrence of obstructive symptoms. There were signs of wound infection and segmental dilatation of the bowel, which, with the presence of ova in the stool, was diagnosed as ascariasis. The patient was treated conservatively with local heat and antihelminthics, with good results. He returned a month later with similar symptoms. Following local heat applications, drainage was established and 2 large worms were found; Later, fecal matter was discharged which, when injected, showed communication with the transverse colon. Healing occurred, without surgery, in 25 days.

LUCIAN J. FRONDUTI, M.D.

The Value Derived from Utilizing the Component Parts of the Transversalis Fascia and Cooper's Ligament in the Repair of Large Indirect and Direct Inguinal Hernia. DAN C. DONALD. *Surgery*, 1948, 24: 662.

Recurrences following the standard (Bassini) operation for large oblique and direct hernias prompted the employment of an operation utilizing the component parts of the transversalis fascia and allied ligamentous structures in such cases. In 116 cases of large oblique, recurrent, and direct hernias in which this procedure was employed, questionnaires sent to the patients showed that there has not been a single recurrence of hernia, with all questionnaires answered except three, which were returned as unclaimed.

The pathology of all inguinal hernia is not the same. To obtain the maximum results in the operation for inguinal hernia, it is necessary to consider the pathologic changes that accompany the different types of hernias in the inguinal supportive tissues. Since the transversalis fascial support is not involved in the small oblique hernia, usually seen in children, the treatment consists simply of the removal and closure of the patent processus vaginalis (sac) down to the fold of the peritoneum, and closure of the internal abdominal ring, as in the Bassini operation.

The chief pathologic features in large oblique and direct hernias are the giving way of the transversalis fascial support and varying degrees of dilatation of the internal abdominal ring. Operations for these hernias should be directed toward restoring these structures to a normal state.

Special emphasis is placed on the importance of including the iliopubic tract in the suture line for closure of the transversalis fascia, to maintain the lateral support of the fascia. In the oblique hernia, the dilated internal abdominal ring should be closed by identifying its arms and approximating them with interrupted sutures above the spermatic cord.

In the operative management, care should be taken to maintain hemostasis, thus preventing hematoma and serum accumulation which might invite infection and weaken the tissue support, and to avoid unnecessary trauma of the tissues, including the nerve supply, which might result in weakened muscles. The operative field should be cleared of areolar and adipose tissues and straggling muscle fibers, for good visualization and prevention of their incorporation in the suture line, which would weaken ligamentous support. CHARLES BRAON, M.D.

GASTROINTESTINAL TRACT

The Gastric Mucosa after Vagotomy for Peptic Ulcer: A Gastroscopic Study. LEONARD M. ASHER. *Gastroenterology*, 1948, 11: 303.

In order to evaluate the effect of vagotomy on the gastric mucosa, 20 patients were studied gastroscop-

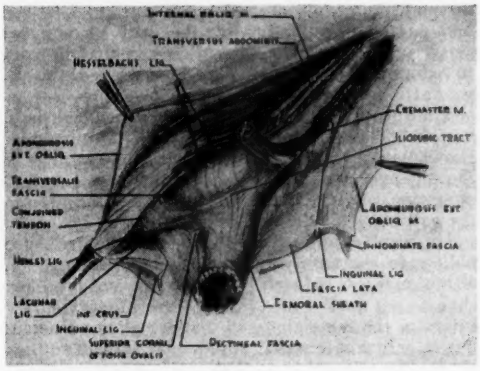


Fig. 1.

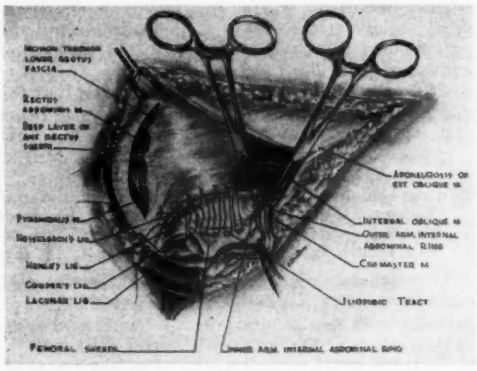


Fig. 2.

Fig. 1 (Donald). The transversalis fascia in the inguinal region. Relationship of iliopubic tract, transversalis fascia, and femoral sheath is shown. Inguinal ligament and fascia lata have been cut and reflected. The transected muscular portions of the internal oblique and transversus abdominis muscles are reflected to show the lateral portion of the transversalis fascia as it is continuous with the femoral sheath below. The separation of the conjoined tendon into its component parts (the transversus abdominis and internal oblique muscles) is shown. Henle's ligament is an inferior lateral expansion of the enveloping fascia and tendon of the rectus muscle, blending and continuous with the iliopubic tract and femoral sheath.

Fig. 2 (Donald). First row of sutures. Three sutures are placed 1 to 2 cm. apart through Hesselbach's ligament and Henle's ligament above, and Cooper's ligament and the lacunar ligament below, including the medial part of the iliopubic tract. The third suture is the last one incorporating Cooper's ligament. The remaining sutures approximate Hesselbach's ligament to the iliopubic tract up to the level of the internal abdominal ring. In cases in which Hesselbach's ligament above is thin, the aponeurosis of the transversus abdominis muscle is included in the suture bite. In this drawing a vertical relaxing incision has been made in the part of the anterior rectus fascia posterior to the external oblique aponeurosis. The inguinal ligament is not shown. The two arms of the internal abdominal ring have been identified and brought into view with Allis clamps preparatory to their approximation with interrupted sutures above the spermatic cord.

ically. Eight had had a transthoracic vagotomy alone; 12 had had a vagotomy and either a pyloroplasty or a gastroenterostomy.

Vagotomy produces definite gastritic changes in the gastric mucosa. These changes occurred in 75 per cent of patients with vagotomy alone, and in almost 50 per cent of patients in whom gastroenterostomy was done at the time of vagotomy. The mucosal changes most commonly seen consisted of hypertrophic gastritis, not limited to any portion of the stomach, and frequently associated with superficial erosions. The vagotomy probably influences the development of gastritis through producing an alteration in the circulation, an altered secretion of mucin with dissociation of acid and mucin secretion, and an altered motility.

These changes perhaps reduce the resistance of the gastric mucosa to physical trauma. Thus, the operation which primarily seeks to separate the gastric mucosa from psychic trauma makes it more susceptible to physical trauma.

It is impossible to correlate the changes seen with the degree of free acidity found after vagotomy; and it is not possible to correlate these changes with the insulin test, in patients who have undergone gastroenterostomy. In patients who had had vagotomy only, the gastritic changes developed in spite of evidence (by means of the insulin test) that the vagotomy had been complete.

The presence of a gastroenterostomy which functions well serves to protect the gastric mucosa from traumatic factors by permitting more rapid gastric emptying, and by allowing the reflux of alkaline small bowel contents. This accounts for the relatively smaller incidence of gastritic changes in the cases in which a gastroenterostomy was done at the time of the vagotomy. SAMUEL KAHN, M.D.

Phlegmonous Gastritis of Staphylococcic Origin. Partial Gastrectomy. Massive Sacral Eschar Caused by Postoperative Pyemia. Failure of Penicillin Therapy (Gastrite phlegmoneuse à staphylocoques. Gastrectomie segmentaire. Escarre sacrée massive et rapide par pyohémie postopératoire. Échec de la pénicillothérapie). R. JOYEUX. *Mém. Acad. chir.*, Par., 1948, 74: 412.

The author reports the case of a woman 50 years of age, who complained of neuralgic pains in the left subcostal region, of 8 months' duration. Towards the end of this period she developed fever. A large, tender mass adherent to the thoracic wall was palpable. Laparotomy revealed that the mass consisted of a large abscess in the anterior stomach wall, which was surrounded by adhesions, involved the small omentum and the gastrosplenic ligament, and was closely fixed to the thoracic wall. The pus contained staphylococci. Treatment consisted of partial resection of the stomach.

Postoperatively, a large gangrenous slough developed rapidly in the region of the sacrum, and the patient died 5 days after the operation, in spite of continued penicillin therapy.

Abstractor's note. It should be mentioned that the dosage of penicillin (200,000 units daily) appears rather low in view of the severe condition.

WERNER M. SOLMITZ, M.D.

Clinical Considerations of Massive Gastroduodenal Hemorrhages (Considerazioni cliniche sulle grandi emorragie gastroduodenali). ELIO PANIZZI and G. SARTESCHI. *Rass. internaz. clin. ter.*, 1948, 28: 305.

The authors review the literature and analyze 42 cases of massive hemorrhage observed among 451 patients with peptic ulcer, who were treated from 1934 to 1947, at the Surgical Clinic of Pisa.

They believe that treatment of the first attack of hemorrhage should follow a medical régime. One should resort to surgery only when the hemorrhage is profuse, repeated, and uncontrollable; and only when, from the history and clinical picture, and (better still) from previous radiologic examinations, one finds that he is dealing with hemorrhage from a calloused or penetrating ulcer.

From numerous and various experiences, the authors have formed two axioms: (1) "rarely is the first hemorrhage mortal," and (2) "repeated hemorrhage aggravates the prognosis."

When surgery is resorted to, the procedure of choice is gastroduodenal resection, which is well tolerated by the patient and offers the surest form of hemostasis. Gastroenterostomy, cauterization, and consecutive inversion of Balfour should be considered only rarely.

When, after repeated transfusions, there is no improvement in the cell count and hemoglobin within 24 to 48 hours, surgery is performed following a rapid and fitting preparation of the patient.

LUCIAN J. FRONDUTI, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Anatomicopathologic and Functional Changes in the Biliary System Following Cholecystointroflexion (Modificazioni anatomopatologiche e funzionali delle vie biliari in seguito alla colecistointroflessione). CARMELO SPAMPINATO. *Policlinico*, sez. chir., 1948, 55: 125.

The author attempts to simplify biliary surgery by trying to eliminate the cavity of the gall bladder without excising this organ. The procedure consists of exposing the fundal half of the gall bladder and placing a purse string suture about the middle. After this the fundus is invaginated and the suture tied. This is followed by a second suture inverting the gall bladder still further.

A brief review of the literature follows, with a description of the different methods of handling the gall bladder, including those of Loreta, Mayo, and Thorek. Only one author, J. Lambret, has used a method similar to that used by the author. Lambret invaginated the fundus of the gall bladder for stasis and atony. His work differs in that he tries to reduce the size of the gall bladder, whereas the author attempts to eliminate the cavity entirely.

The author has performed this operation on 8 dogs, and describes each operation in detail. This includes the cholangiogram reports, the pressure readings of the different parts of the biliary system at a second operation, and the histologic study of sections from the gall bladder and liver.

The results obtained show that it is not possible to obliterate the cavity of the gall bladder entirely, although it was reduced to as much as, and even less than 10 per cent of the original size. Moderate dilatation of the remaining gall bladder often occurred, but in only 1 case was it appreciable enough so that it could be referred to as cholecystic regeneration, as reported by Balice and others.

The invaginated mucosa shows atrophic changes side by side with proliferative changes. The cause for this is not understood, but the changes may represent an attempt at regeneration.

The remaining ducts undergo dilatation which, however, is not constant, and there is usually an increase in pressure. Oddi maintained that there was a primary period of atony lasting 1 month, followed by hypertonicity of the sphincter when cholecystectomy was performed. The findings in these experiments, however, showed a normal, hypotonic, or hypertonic status of the sphincter of Oddi during the first month.

The hepatic cells showed degenerative changes which diminished or were even absent as the time interval following operation increased.

LUCIAN J. FRONDUTI, M.D.

Differential Diagnosis Between Medical and Surgical Jaundice by Laboratory Tests. HANS POPPER and FREDERICK STEIGMANN. *Ann. Int. M.*, 1948, 29: 469.

The first problem in the differential diagnosis of the jaundiced patient is the distinction between the presence or absence of liver cell damage, and of marked interference with the bile flow. In general, the patient with medical jaundice has impairment of liver cell function; the patient with surgical jaundice has marked interference with the bile flow.

The follow-up studies of a large number of patients with an established diagnosis of jaundice permits an evaluation of liver function tests indicative of liver cell damage. At least two of the tests should be positive, before the presence of liver cell damage can be established, since every one of the tests may yield biologically false results occasionally.

In 135 cases, a combination of the thymol turbidity test with either the cephalin-cholesterol flocculation or the albumin-globulin ratio permitted recognition of liver cell damage in two-thirds of the cases. A combination of the cephalin-cholesterol flocculation test with the albumin-globulin ratio permitted this in a slightly smaller number of cases. If two posi-

tive results in all three tests were accepted, 83 per cent of the cases were correctly classified. The addition of the cholesterolester-cholesterol ratio, i.e., at least two positive results in the four tests, raised the percentage of correct diagnoses significantly. The results of urinary urobilinogen determination, bromsulfalein retention, and hippuric acid synthesis added only a few more cases. In the vast majority of cases, therefore, liver cell damage can be diagnosed by means of four tests: cephalin-cholesterol flocculation, thymol turbidity, albumin-globulin ratio, and cholesterolester-cholesterol ratio. The thymol turbidity test reduces the number of other more complicated tests required to classify cases correctly.

One test denoting marked bile flow interference was considered sufficient to indicate that phenomenon. In one-third of 134 cases, absence of urinary urobilinogen was the only positive test. In combination with other tests, this absence was demonstrated in two-thirds of the cases. Marked elevation of the serum alkaline phosphatase alone was found in a relatively small percentage. If one positive test in the determination of either urinary urobilinogen or of serum alkaline phosphatase, or of both, was used as a criterion, almost all cases in this group were accounted for.

One is struck by the frequent concurrence of both liver cell damage and marked bile flow interference—in 34.7 per cent of the cases studied. The previously stated premise that in medical jaundice there is only liver cell damage, and that in surgical jaundice, as a rule, there is only marked bile flow interference is therefore incorrect in a significant number of cases. Of the medical cases, 26.3 per cent were complicated by marked interference with the bile flow. Of the surgical cases, 60 per cent were complicated by liver cell damage. SAMUEL KAHN, M.D.

Acute Torsion of the Gall Bladder. FRANCIS X. HAINES and JOHN T. KANE. *Ann. Surg.*, 1948, 128: 253.

Acute torsion of the gall bladder is an entity which is seldom mentioned in American literature. It occurs predominantly in elderly people, particularly of the visceroptotic type. As late as 1946, only 76 cases had been reported. As would be expected, torsion occurs in those cases in which the gall bladder is free and completely surrounded by peritoneum. The relation between torsion and the movement of normal peristalsis in the transverse colon is mentioned also; loss of elasticity of supporting structures may be a factor; stones do not seem to be an associated complication. In most cases the onset is acute, with sudden, severe, right upper quadrant pain which may radiate to the back. Vomiting is a frequent finding. The mass, felt in more than half of the cases, is usually tender; jaundice is rarely present. Early temperature, pulse and respiration are normal, but later they may show a marked rise. "Symptoms of peritonitis appear when the gall bladder becomes gangrenous and perforates." In the differential diagnosis, cholecystitis or cholelithiasis must be considered. Appendicitis, intestinal obstruction, twisted ovarian cyst, and ruptured peptic ulcer must also be considered. Early surgery is the treatment of this condition.

The author presents the case of a 63 year old man who had a smooth pear-sized mass one inch above the umbilicus and to the right of the midline. This was exquisitely tender, and rigidity was present. A diagnosis of ruptured ulcer was made, and the patient was operated upon. A dark, shining gall bladder, twisted at the neck to 360 degrees, was removed. ROBERT E. FLORER, M.D.

Operative Cholangiography (La cholangiographie operatoire). P. L. MIRIZZI (Cordoba, Argentine). *Lyon chir.*, 1948, 43: 385.

Operative cholangiography is accomplished by the injection of an opaque substance, usually lipiodol, into the gall bladder or the common duct. The author, in reviewing the results obtained during 15 years of experience with the method, is convinced that the physiopathological state of the biliary tract can be determined with a great deal of certainty by the use of the method described.

Functional dyskinesia of the sphincter of Oddi, as well as complete or partial stenosis at the terminal bile duct may be demonstrated by the pencil-shaped, elongated, and dilated appearance of the common duct. This condition is due to the relative or absolute obstruction at the sphincter.

Various congenital anomalies such as cysts or pseudocysts of the extrabiliary tract, postoperative biliary strictures, and anatomic narrowing of the terminal common bile duct from pancreatitis not only can be identified as such, but their location can be established as well. The method is especially useful in demonstrating overlooked common duct stones as the cause of postcholecystectomy syndromes.

ORVILLE F. GRIMES, M.D.

Hepatic Duct Syndrome (Sindrome del conducto hepatico). PABLO L. MIRIZZI. *J. internat. chir.*, Brux., 1948, 8: 731.

Cholangiography performed at operation has confirmed the hypothesis of a contractile mechanism in the common hepatic duct, where its presence had been suspected on anatomic grounds. Histology completes the demonstration by revealing the presence of small annular and corkscrew muscle bundles along the entire canal. This mechanism has a propulsive function in the excretion of bile, with a phase of dilatation (diastole) and one of contraction (systole). It has also a protective role, the effect of which is clearly shown not only in the normal biliary passages but also in the dilated choledochus which in its terminal portion impedes more or less the free entrance of bile into the duodenum. Experimental studies and biliary pathology provide valid confirmatory evidence of the protective role played by the hepatic duct system, and this protective function justifies the performance of choledochoduodenostomy in cases of partial or complete obstruction of

a permanent nature which would inevitably lead to the icteric syndrome, cholangitis, and hepatic insufficiency.

The hepatic duct syndrome, which is characterized by stasis in the hepatic system, is the result of a functional disturbance and of anatomic factors; the functional disturbance consists of a spastic condition of the hepatic duct; the anatomic factors may be a local scar, an abnormal vessel, a displaced Hartmann pouch, a calculus at the entrance of the gall bladder, or an obstruction at the junction of the cystic and common bile ducts. A calculus is the most frequent causal factor.

The syndrome simulates the icteric picture of calculus in the common bile duct, but the jaundice usually disappears spontaneously or after passage of a duodenal tube; in exceptional cases it persists until operation.

Clinical evidence, cholangiography, bacteriology, and pathologic anatomy confirm the existence of a hepatic duct syndrome due to cholangitis without calculus. The facts observed support the pathogenic concept of a descending infection, the first manifestations of which are limited to the hepatic duct system. The same data suggest that certain painful sequelae of operations for cholelithiasis have their origin in unrecognized functional or anatomic factors connected with the hepatic duct mechanism.

During a laparotomy the surgeon should determine the functional and morphologic condition of the hepatic duct system in an attempt to reduce as far as possible the incidence of the painful sequelae of cholecystectomy; this can be done only by cholangiography during the operation.

RICHARD KEMEL, M.D.

Strictures of the Common Duct. WARREN H. COLE, JOHN T. REYNOLDS, and CARL IRENEUS, JR. *Ann. Surg.*, 1948, 128: 332.

Operative trauma is the most common cause of common duct stricture. Sixty-five per cent of this series of 49 cases of stricture could be directly attributed to operative trauma.

The operative mishaps responsible for the trauma are: excision of part of the common duct while it is under tension by traction on the gall bladder; ligation of all or part of the duct while ligating a bleeding vessel; damage to the duct during gastrectomy, and damage during choledochostomy. Another cause of stricture is obliterative cholangitis which may be caused by a collection of bile overlying the common duct; a small abscess adjacent to the duct; large masses of ligated material around the duct, or possibly pylephlebitis. In 10 per cent of this series of cases stricture was caused by a chronic pancreatitis of the diffuse fibrosing type. There are other less common causes.

The authors list 12 measures to avoid operative trauma of the common duct, as follows:

1. Maintain carefulness, and refrain from hurry while dissecting structures near the common duct.

2. Obtain good exposure of the region about the common duct with a long incision. The incision may be oblique, transverse or longitudinal, but should be of sufficient length to give adequate exposure.

3. Obtain adequate relaxation with the proper anesthetic. Ether is an adequate anesthetic in obtaining this relaxation, but cyclopropane and curare are likewise effective.

4. Isolate the junction of the common duct and the cystic duct before ligating the latter structure.

5. Ligate no artery until it is proved that it enters the gall bladder.

6. Ligate the cystic duct and artery separately.

7. Cut no structure until it is identified.

8. Ligate the cystic duct at least one-half inch from the common duct. This distance will protect the common duct and likewise prevent reformation of a bulbous tip.

9. Control hemorrhage by pressure with the index finger of the left hand in the foramen of Winslow against the thumb, so the bleeding point can be controlled by compressing the hepatic artery. By gradual release of compression the bleeding point can be identified and caught accurately with an artery forceps.

10. If adhesions are dense around the common duct, start dissection at the fundus of the gall bladder and ligate the duct or ampulla high.

11. Eradicate gall bladder disease early before massive inflammation takes place.

12. Be familiar with the abnormal anatomy as well as the "normal." The anatomy of the biliary tract is so varied that we can identify no position of the various structures as normal. Normal can only be considered a composite of those types most commonly observed.

Methods of repair are described, and they vary with the level and extent of the stricture.

Local strictures. In cases in which the hilus of the liver is not involved, repair is performed by simple excision with end-to-end anstomosis. The suture line is supported by a "T" tube inserted at least one-half inch below the anastomosis.

Stricture of the distal end only may be repaired in several ways. Side-to-side anastomosis to the duodenum with the use of a longitudinal incision in the side of the common duct is favored by the authors. Another method is to transplant the end of the common duct into the duodenum.

Stricture of the proximal portion of the duct should be treated, if possible, by mobilizing and anastomosing the distal end of the duct, if it can be found, to the hilar duct.

Absence of the entire duct is the most difficult, and the end results of repair are the poorest. The Roux Y arm of jejunum is superior to anastomosis of the duct to a functional loop of intestine.

The hilar duct, if not visible after dissection, may frequently be located by aspiration. The duct may then be opened by incising along the needle with a bistoury and enlarging the opening by blunt or sharp dissection. The duct may then be anastomosed to the arm of the jejunum over a vitallium tube, rubber tube, or catheter inserted up through the arm of

bowel into the hilar duct, the other end brought out through the abdominal wall.

The authors recently have devised a new method of anastomosing the defunctioned arm of the jejunum to the hilar duct. It is in essence a jejunal graft which is formed by separating the serosa and muscularis from the mucosa for 2 to 3 cm. at the distal end of the jejunal arm. The flaring end of the bell end of a catheter is cut off and anchored in the mucosal graft with several silk or cotton sutures. The resultant tubular graft of mucosa, supported by the truncated cylinder of rubber tubing, is inserted with the narrow end into the liver up to the bile duct and anchored with two silk sutures.

The results of 63 operations performed upon 49 patients are summarized. Among 28 patients with a Roux Y type of arm, excellent results were obtained in 78 per cent. In 4 of these, the new procedure was used, with good results in 3. Excision of local strictures produced excellent results in 86 per cent. The results with anastomosis from the hilar duct to the duodenum were excellent in 14 per cent, and fair in 28 per cent; failure occurred in 58 per cent. Miscellaneous repairs were excellent in 60 per cent; failure occurred in 40 per cent. The overall operative mortality was 6 per cent.

FREDERICK C. HOEBEL, M.D.

Etiology of Acute Pancreatitis. ROLF LIUM and STEPHEN MADDOCK. *Surgery*, 1948, 24: 593.

Experiments with the production of acute pancreatic inflammation and fat necrosis by tying the pancreatic ducts and stimulating the pancreas, have been reported. Stimulation of the pancreas has been produced by (1) feeding, (2) acetylcholine and eserine, (3) pilocarpine, (4) stimulation of the vagus, and (5) secretin. In a high percentage of these experiments combining obstruction of the pancreatic ducts and stimulation of the gland, acute inflammation of the pancreas and fat necrosis resulted. The most extensive and consistent damage resulted when the animals were fed 2 hours before ligation of the pancreatic ducts.

The different mechanisms that can produce obstruction of pancreatic secretion were discussed. The clinical and experimental evidence was correlated to explain the varying degree of acute pancreatitis seen at operation or at autopsy.

Acute pancreatitis is the result of ductal obstruction in an actively secreting pancreas.

CHARLES BARON, M.D.

MISCELLANEOUS

Acute Abdominal Disease in the Aged. WILLIAM C. BECK. *Surg. Clin. N. America*, 1948, 28: 1361.

Eight hundred and eighty-two patients over the age of 65 were admitted to the Guthrie Clinic, Sayre, Pennsylvania, during a 5 year period, with abdominal complaints. In 21 per cent of these the condition could be classified as acute. The diagnostic problem in elderly people with acute abdominal disease is usually not the same as that in younger patients, because of various factors.

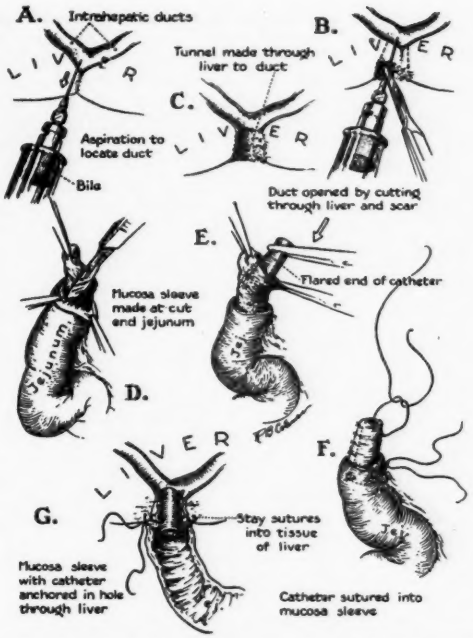


Fig. 1 (Cole, Reynolds, Ireneus). Repair of stricture of common duct by preparation of a mucosal tube and implantation as a graft into the duct opening at the hilus of the liver (modification of Hoag operation). This procedure is most applicable when no stump of duct remains, and scarred liver tissue must be incised to reach the duct. Depth of the scarred area is exaggerated to better illustrate the method. The mucosal tube is pulled into position and held there by two sutures, each of which is inserted from the outside into the depth of the opening, through the mucosal sleeve, and back through the depth of the opening to the outside where the two ends of each suture are tied together.

Precious time is lost because families are often convinced that the older members must have aches and pains, and that age itself is such a deterring factor to surgery that it is practically hopeless to ask for surgical aid. As a result, older people come into the hospital far later than a similar group of young people.

Cholecystitis with its complications is considered to be the most common acute abdominal disease in the aged, if cases of strangulated hernia are considered separately from those of strangulation from other causes. Over 60 per cent of all abdominal complaints in the aged, however, fall into these three diagnoses. Next in frequency is diverticulitis and its complications. Appendicitis and perforations, and other complications such as peptic ulcer, encountered so frequently in the young, are the least common of the major acute diseases of the aged.

In the present series, acute gall-bladder disease was recorded in a patient of 89 years. The pain is usually far more diffuse than in younger individuals and often is centered considerably lower in the abdomen than it is in the young. The pain does not radiate so characteristically to the scapular region, and in some patients may radiate directly through to the region of the upper lumbar vertebrae. The tenderness of the abdomen is rarely well defined and localized, and the muscle guarding may be quite diffuse. Fever is often totally absent and the leucocyte count is also completely unreliable. The course of the acute process is possibly more fulminating in the older patient. Rupture of the gall bladder occurs with greater frequency and the patient is less apt to recover spontaneously.

Calculi in the common bile duct are as frequent in the aged as in people in middle life. It is the author's conclusion that patients of advanced age with acute gall-bladder disease should be given a trial of conservative therapy, but with much closer and far more frequent observation than younger patients. Unfortunately one must rely almost entirely on clinical sense, since laboratory aid is of little consequence. Operation is indicated unless the patient improves perceptibly under conservative treatment.

Subacute obstructions of the colon which are due to carcinomas of the bowel may often be relieved by conservative measures. On the other hand, the complete obstructions require a decompressive procedure. In older patients, colic is often not as severe as in the young, while distention may be tremendous. X-ray interpretation is somewhat more difficult since the ileocecal valve is more frequently incompetent.

The diagnosis of femoral hernia is frequently missed in the admitting room and it is usually not discovered until the patient is in the ward. Other causes of obstruction are more difficult to diagnose. Mesenteric thrombosis was diagnosed in two of three instances in this series, and one patient was saved by massive bowel resection. The indications for surgical intervention are complete obstruction of the colon, strangulation obstruction, and irreducible hernia.

The operations were usually carried out under spinal anesthesia and in most instances this seemed to be ideal. Probably in no disease of the aged is the importance of adequate nutritional balance as necessary as in bowel obstructions. Full hydration, and protein and vitamin balance must be maintained parenterally. Repeated studies of the alkali reserve and of the urinary nitrogen excretion are of real value in guiding the therapy. Renal balance is often precarious, and the reserve low in the aged, so that salt retention may be a real problem.

The mortality in 34 cases of strangulated hernia was 11.76 per cent. Patients 88 years of age were operated upon successfully for hernia. The length of time that some of these aged patients have known of their hernias is remarkable. One patient in the author's series had worn a truss for 40 years. Attempts at reduction by taxis are made first. This is attempted only if the pressure on the sac is not painful and if the patient has not had any sedation for a period of 4 hours. A hernial sac containing bloody fluid will usually be hard and tender and the patient will usually not permit taxis. Placing the patient in a Trendelenburg position for 15 minutes will often facilitate reduction. If this is unsuccessful, an emergency operation is performed. The anesthetic used for such operations consists of a combined anesthetic routine with a field or intercostal block supplemented by pentothal or an inhalation medium in very small amounts. In the male with an inguinal hernia, the author often removes the testis, thereby saving time and securing a simpler repair. Early ambulation is of benefit.

Colonic diverticulitis and its complications seems to have replaced appendicitis as a frequent cause of acute inflammatory disease of the abdomen in the aged. In all but one of 33 patients in this series the inflammatory lesion was situated in the area of the sigmoid colon; in 1 patient the lesion was in the cecum and had perforated.

The therapy of diverticulitis in the aged, like that in all age groups, is dependent upon the stage of the disease. Only for perforations with a diffuse spreading peritonitis is immediate operation necessary. This consists of exteriorization of the perforated segment, or a proximal colostomy. In patients with localized processes, conservative therapy is usually adequate. At present the author is using sulfacetamide and either sulfadiazine or combisul. As soon as the acute process has subsided, sigmoidoscopic and roentgenographic techniques are employed for further diagnosis.

Only 8.8 per cent of the patients with acute abdominal distress had acute appendicitis. These patients had either gangrene of the appendix or a perforation, due more to the late arrival of the patient at the hospital than to the rapidity of the process. The oldest patient with acute appendicitis was 79 years of age. All patients subjected to operation survived.

Of the author's series of 7 cases of perforated peptic ulcer in patients over the age of 65, operation was performed on 6. All of these patients survived. The age of the oldest patient was 86. The diagnosis of perforated peptic ulcer in the aged is not much different than diagnosis in younger individuals. Operation consisted of a high right paramedian incision, and suture of the perforation with either catgut or cotton, with the use of through-and-through sutures. Omentum was tied into the knot. Gastric suction was maintained for 48 hours and ambulation was started on the third day.

In no field of acute surgery is more judgment or tact necessary than in the aged. Many old people feel themselves beyond the age at which surgical intervention is possible, yet there is appreciable preservation of health which surgery can offer to patients within this group. HAROLD LAUFMAN, M.D.

GYNECOLOGY

UTERUS

Contribution to the Study of the Association of Utero-Ovarian Neoplasms in Women with Uterine Fibromyomas (Contributo allo studio delle associazioni neoplastiche utero-ovariche in donne portatrici di fibro-miomi uterini). MARIO OPOCHER. *Ann. ostet. gin.*, 1948, 70: 200.

The author gives an extensive bibliography concerning multiple tumor formation in general and the association of benign with malignant tumors in particular. However, concurrent development of multiple tumors in the genital organs is relatively rare.

In a material consisting of 726 cases of fibromyomas the author encountered 3 cases of sarcoma of the uterus, 16 cases of carcinoma, 27 of serous ovarian cysts, 2 of parovarian cysts, 4 of tubo-ovarian cysts, 2 of ovarian fibromas, 3 of ovarian papillomas, and 1 case of carcinoma of the ovaries. Sarcoma of the uterus was present in 0.45 per cent and carcinoma of the uterus in 2.2 per cent of the entire material.

While some consider a simultaneous occurrence of two different tumors in the genital organs as pure coincidence, others believe that an intimate genetic relation exists between both tumors.

Numerous workers maintain that an ovarian hormone exerts its effect on the uterine muscles. In the presence of ovarian dysfunction, such a hormone may represent an important factor in the development of a tumor.

Macroscopic and microscopic study of 3 cases of sarcoma associated with fibroma convinced the author that the malignant degeneration was not a primary process but followed the degeneration of fibrous nodes.

Possibly the coexistence of two different neoplasms may be due to one single factor.

As to the simultaneous occurrence of ovarian tumors and tumors of the uterus, the existence of a functional utero-ovarian synergism suggests that an abnormal stimulus of the fibromyoma may be responsible for the development of an ovarian tumor.

It is evident that a failure to disclose the presence of two different tumors in the same patient may be responsible for improper treatment.

JOSEPH K. NARAT, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Results of Operation for the Restoration of Tubal Patency (I risultati delle operazioni per il ripristini della pervieta tubarica). E. PASCA. *Ann. ostet. gin.*, 1948, 70: 328.

Occlusion of a tube may develop in its intramural portion, the isthmus, the ampulla, or in the region of the abdominal ostium. The occlusion may be of congenital origin, caused by a defect in the evolution of Mueller's organ, or by an intrauterine inflammatory process. More frequently a tube becomes occluded following an infection by gonococci, or colon or tubercle bacilli, and compression by a cyst or a neoplasm of an abdominal organ, bridges, or adhesions caused by extrinsic processes such as appendicitis may also be the responsible factors.

The following operations have been suggested for restoration of the patency of an occluded tube: ovarosalpingolysis, salpingostomy with salpingostomatoplasty, and resection of the uterine horn and the isthmic portion of the tube followed by implantation of the remaining part of the tube into the uterus.

Of 364 patients operated on for tubal occlusion, 202 could be followed up.

In 52 a bilateral tubal resection, bilateral salpingostomy, and stomatoplasty were performed. Pregnancy occurred after the operation in 9.6 per cent of this group.

In 110 patients a unilateral tubal resection with salpingostomy and stomatoplasty was performed and the other tube was preserved. In this group gestation followed the operation in 15.3 per cent of the cases.

In 9 cases resection of the tubal angle and implantation of the tubes were performed. The operation was done on one side in 1 patient and on both sides in 8 patients. In 44 per cent of this group pregnancy followed the operation.

Gestation was recorded in 20 per cent of the group of 5 patients in whom ovarosalpingolysis had been done.

In 17, or 8.4 per cent, of the total group of 202 patients subjected to operation, gestation was recorded, but only in 6 was the gestation carried to full term.

An operative procedure for occlusion of a tube is indicated only if the patient is younger than 35 years, if there is no evidence of inflammatory changes in other parts of the genital tract, if there are no signs of infantilism, and if no disturbance of other organs associated with internal secretion are present.

JOSEPH K. NARAT, M.D.

EXTERNAL GENITALIA

The Influence of Gonadotropic Hormones on the Biology of the Vagina. Physiologic Bases (L'influence des hormones génitales sur la biologie du vagin; bases physiologiques). J. A. SCHOCKAERT and J. FÉRIN. *Gyn. obst.*, Par., 1948, 47: 421.

Histologic and chemical studies of the vaginal epithelium provide valuable information on the action of sexual hormones. They enable the physician to form a correct judgment as to the hormonal equilibrium and, by repeated examinations, to control the effect of his treatment.

The following procedure should be followed: (1) histologic examination of the vaginal epithelium; (2) determination of glycogen content by carmine stain, by the Schiller test, or by quantitative analysis; (3) determination of the *p*H by colorimetric or electrometric methods; (4) examination of the vaginal content, either by smear or by aspiration; (5) bacteriological studies.

Four types of cells from the epithelium are found. The first of these are so-called "atrophic" cells from the deep layer of epithelium; they are small, with large nuclei and basophil cytoplasm. The second are intermediary cells from the spinous layer; these are larger, oval, or fusiform and basophil, with intensely staining periphery. The third are superficial cells; these are large, squamous, polygonal, mostly with acidophil protoplasm and pyknotic nucleus. The fourth are acidophil cells without nucleus. The proportion of each of these types of cells varies in a characteristic way during the monthly cycle.

The authors describe in detail the histology and chemistry of the vaginal epithelium during fetal life, in the newborn, in the prepuberal period, in the adult, in pregnancy, in the puerperium, and in the menopause. The production of estrogen determines the growth and differentiation of the epithelium in puberty and its involution at the climacteric.

The production of progesterone causes desquamation of the superficial layers, and other typical changes. It is, however, difficult to determine the time of ovulation by a study of vaginal curettings.

The acid reaction of the vagina is caused by endocrine factors and not by the Doederlein bacillus. However, experiments carried out during the prepuberal period show that the Doederlein bacillus produces a considerable increase of acidity.

WERNER M. SOLMITZ, M.D.

The Influence of Gonadotropic Hormones on the Biology of the Vagina. Pathology and Therapy (L'influence des hormones génitales sur la biologie du vagin; pathologie et thérapeutique). H. DE WATTEVILLE and L. DANON. *Gyn. obst.*, Par., 1948, 47: 437.

An insufficient or excessive output of sexual hormones changes the histologic structure of the vagina, its glycogen content, its *p*H, and its bacterial flora in a typical way. For this reason, various affections of the vagina can be treated successfully with gonadotropic hormones.

Low estrogen output causes atrophy of the epithelium and a decrease of glycogen content. The consequent diminution of acidity favors the development of a pathogenic flora. Thus, atrophic vaginitis and, in the most severe cases, kraurosis may develop. The vagina becomes more susceptible to mechanical, chemical, or infectious lesions.

Estrogen treatment is indicated not only in atrophic vaginitis of adults, but also in vaginitis of the prepuberal period, and in vaginal hypoplasia.

On the other hand, an abnormal increase of estrogen may cause hyperemia, leucorrhea, and an increase of acidity, and may lead to the development of mycoses. Abnormally high acidity may also be a cause of sterility.

Increased progesterone production, as in pregnancy, causes venous hyperemia, softening of the mucosa, and transudation.

The administration of testosterone causes atrophy of the vaginal epithelium with a decrease in glycogen and acidity. It is indicated in conditions of abnormally high estrogen production.

WERNER M. SOLMITZ, M.D.

Fibromyomas of the Vagina (I fibromiomi della vagina). LIVIO CERVELLATI. *Ann. ostet. gin.*, 1948, 70: 235.

Two cases of fibromyoma of the vagina in middle-aged married women are reported. One patient had never been pregnant, the other had had 3 pregnancies and 1 normal childbirth. In the nullipara, the growth was silent and was discovered accidentally; in the other woman there was some metrorrhagic bleeding which brought her to the gynecologist. In both of these patients the vaginal new growths were associated with a fibromatous uterus and the vaginal tumor was at first thought to be a subligamentous cervical fibroid.

In both instances a total hysterectomy was done, with removal of that part of the vaginal wall to which the tumor was adherent. Histologic examination then disclosed the fact that the pedicle took origin from the smooth vaginal musculature—from the right side of the vaginal fornix in one patient, and from the left in the other one. The histologic study of the tumors themselves showed that they were fibromas with a vast predominance of the fibrous elements, especially at a distance from the insertion of the pedicle. There was no evidence anywhere of epithelial glands, or centers of hyperplasia of muscular tissue, which would support the theory of their origin from embryonic rests or from remnants of the Wolffian duct.

Despite the lack of evidence of dysembryogenesis, the author believes that these tumors arose from a disordered embryogenesis with remnants of the embryonic elements persisting until the ages of 40 and 42 years, respectively. At these ages there arose a proliferative morbigenic stimulus which, in the light of modern concepts, is envisaged as an augmentation in the production of folliculin, this augmentation taking the character of increase in quantity and also of increased duration (dysfolliculinism).

JOHN W. BRENNAN, M.D.

MISCELLANEOUS

Roentgen Diagnosis in Gynecology and Obstetrics. Roentgen Diagnosis in Gynecology (Le radiodiagnostic en gynécology et en obstétrique. Le radiodiagnostic en gynécologie). R. KELLER. *Gyn. obst.*, Par., 1948, 47: 439.

The author gives an exhaustive report on the use of hysterosalpingography for diagnostic purposes.

The capacity of the normal uterine cavity does not surpass 2 to 3 c.c., but may be much greater in pathologic cases. It is important to use the manometer for measuring the tonus of the uterine musculature, which is normally between 4 and 6 cm. Hg in the week following menstruation. In uterine hypotony it may drop to 2 or 3 cm. and in spastic dysmenorrhea it may be elevated up to 10 or 15 cm. In order to fill the tubes with contrast material a pressure of at least 10 cm. must be applied, but it should never surpass 30 cm. Hg.

As to the different substances in use, the author believes that perabrodil, initiated by Kjellberg of Sweden, is superior to lipiodol or thorium salts. This watery solution is very liquid and passes through even very narrow tubes; furthermore, it has the advantage of mixing freely with liquid material as in hydrosalpinx or ovarian cysts. It can be used without risk in metrorrhagia, and as it diffuses readily to the circulation, no danger of embolism is present. It is eliminated by the kidneys in from 0.5 to 2 hours. In contrast to this fast elimination of an aqueous solution, lipiodol that has entered the free peritoneal cavity by way of the tubes disappears usually after 6 to 8 weeks; however, in fixed pockets and recesses, it may stay for months or years.

The risk of hysterosalpingography is minimal if the procedure is performed technically correctly. Local reactions ("oil peritonitis") are extremely rare and seem to occur only when the amount of injected lipiodol is unduly large. In such cases local peritoneal irritation may give rise to adhesions. The only two contraindications are acute inflammatory processes and the possibility of pregnancy. The best time to perform the examination is between 5 and 7 days after menstruation.

The study of the evacuation of the contrast material by means of a series of films is important for the diagnosis of hypertony or hypotony of the uterus.

The clinical application of hysterosalpingography is manifold and helpful for the diagnosis of the majority of pathologic processes in the genital tract. Malformations and infantilism of the uterus, polyps and submucous tumors of benign or malignant character, retention of placentar tissue, and other pathologic conditions can be diagnosed with less risk and greater exactitude than by any other clinical method. In metrorrhagia of hormonal or other origin, curettage is the method of choice but hysterosalpingography often gives valuable additional information if applied by the "thin layer" method which produces a well differentiated relief of the mucous surface. The same is true in pathology of the tube and ovary. Various types of salpingitis, hydrosalpinx, stenosis, and occlusion of inflammatory or mechanic origin can be differentiated by this method.

However, the study of sterility has benefited from hysterosalpingography more than that of any other field in gynecology. It is no longer admissible to start the treatment of sterility without the information given by this method. Not only the condition and permeability of the tubes, but a number of other pathologic processes like malformations, uterine deviations, and cervical irritations, may be the cause of sterility and can be discovered roentgenologically.

Finally, pelvic tumors outside of the uterine cavity can be visualized by a combination of hysterosalpingography with pneumoperitoneum.

WERNER M. SOLMITZ, M.D.

Amenorrhea Among the Inmates of German Concentration Camps in 1944 and 1945 (L'amenorrea nelle internate nei campi di concentramento tedeschi, 1944–45). EMIL MENYASZ. *Ann. ostet. gin.*, 1948, 70: 271.

Practically all female inmates of the concentration camp in Auschwitz were suffering from amenorrhea, which lasted from 3 to 4 months.

The author ascribes this phenomenon to an inhibition of the neuroendocrine centers.

In instances in which the amenorrhea lasted more than 3 or 4 months, other factors had to be considered. These cases could be divided into two groups: (1) the psychic, in which the causes were anguish, confusion, and uncertainty, and (2) the physical, in which the causes were mainly inanition, hypovitaminosis, and overwork.

JOSEPH K. NARAT, M.D.

The Cytology of Neoplasms of the Female Genital Apparatus, Before and After Radium Treatment, Studied by the Apposition Method (La citologia die neoplasmi dell'apparato genitale femminile, prima e dopo trattamento radium, studiata con il metodo della apposizione). MARIO BIANCHI. *Tumori, Milano*, 1948, 34: 82.

The impetus given to the interpretation and evaluation of the radiation changes to be observed in the normal and abnormal cells of the female genital tract by recent studies, particularly those of Ruth M. Graham (*Surg. Gyn. Obst.*, 1947, 84: 153 and 166), makes further examination of the subject seem desirable. The author's material included 45 cases of neoplasm of the female genitalia, consisting of 25 epitheliomas of the portio, 10 of the undifferentiated type, 3 spinocellular, and 8 basocellular; 4 were unclassified carcinomas. There were also 3 adenocarcinomas of the cervical canal and 13 of the uterine corpus, 2 ovarian cancers, 1 chorioepithelioma, and 1 primitive carcinoma of the vagina. In addition to the usual vaginal smear, serial biopsy, and histologic methods, the author employed the method of apposition. This consisted in pressing the glass microscopic slide lightly against the area to be examined. When this slide is pulled away it brings away with it both neoplastic and normal cells and this specimen is then fixed with methyl alcohol, stained by the Giemsa method, and examined just as is done in blood smears. The apposition method was also extended to the study of such normal tissues as the ovary, placenta and other tissues of human preg-

nancy, and to the noninfiltrative type of chorionic mole.

The author does not state that his findings were essentially different from those reported by Graham, but his purpose in making the study was not so much the solving of the question of prognosis and evaluating the efficacy of irradiation as apposed to surgery, as the determining as to whether any one characteristic of the cells, or any combination of characteristics of the single cell—irradiated or not—would establish a diagnosis between the normal and neoplastic cell in this region, or between the different types of neoplastic cell.

From the results of these studies it is concluded that no single characteristic of the cells and no combination of characteristics of a single cell in this material will establish a certain distinction between the neoplastic and the normal cell. It is true that a general consideration of all the characteristics of the different types will usually enable a distinction between the cell of carcinoma of the female genital tract and the normal cells of the same region, or between the neoplastic cell and the cell of other morbid conditions not neoplastic in nature. Even the individual response of these different types of cells to irradiation treatment does not render the distinction more reliable. In general, by the general consideration of all the characteristics of all the cells in a single patient studied, a distinction can be made between cancer and normal tissues or non-neoplastic morbid tissues; however, not even the response to irradiation will distinguish reliably the different types of carcinoma, such as the epidermoidal type and the adenocarcinoma. In the case of the chorionic cells not even the distinction between the neoplastic and non-neoplastic forms can be reliably made. In other words, the information to be garnered from a study of the cytology of the female genital tract is purely orientative in character, and in such a sense it may be practically utilized.

The practical utility of the method resides in the possibility of its application for following the general effects of the irradiation treatment, with its succession of degenerative and destructive changes in the nucleus and protoplasm day after day, by a simple, innocuous, and rapid method of examination until that time when all neoplastic elements have disappeared. In this sense the apposition method is superior in most respects to biopsy.

JOHN W. BRENNAN, M.D.

Peridural Anesthesia in Gynecology. Technique and Experiences. (Periduralanaesthesie in der Gynaekologie. Technik und Erfahrungen.) GUENTHER SCHMIDT. *Geburtsh. & Frauenh.*, 1948, 8:549.

A 2/1000 solution of pantocain in water is injected, with the precautions peculiar to this method and the precautions common to ordinary lumbar anesthesia, into the space between the ligamentum flavum and the spinal dura, that is, the peridural space. The amount injected is usually 45 c.c., and the lumbar interspace chosen for the needle puncture is usually the third or fourth. Injection through the fourth interspace will usually be sufficient for perineal procedures, while the third lumbar interspace is usually utilized for laparotomies.

In the presence of technical difficulties, such as the accidental perforation of the dura in the third interspace, or for the removal of very large tumors, the second interspace may be used. The anesthetic solution is usually injected in 10 c.c. fractions at 10 minute intervals and in 25 minutes after the last injection the anesthesia is usually advanced to the point where the operation can be started. The anesthesia, as a rule, lasts from 3 to 5 hours.

The advantages of this method of anesthesia are its long duration (from 3 to 5 hours) which enables several patients to be prepared at one time, enables the operation to be delayed while some emergency operation is done, or the operation itself may be extended if conditions demand it. The maximal relaxation of the abdominal muscles together with the almost complete maintenance of intestinal tone renders the gynecological abdominal field more approachable and the manipulations less traumatizing. Following the operation the patient may be placed in any position in bed and does not need someone in constant attendance. The anesthetic is not followed by headaches or vomiting. Bowel and kidney functions continue undisturbed, and respiratory sequelae have not been observed.

The only contraindications to peridural lumbar anesthesia are local inflammatory processes and extreme deformity of the lumbar vertebral column (the ordinary grades of scoliosis are not contraindications), diffuse peritonitis, nephritis, ileus, or other conditions tending markedly toward circulatory collapse.

Since the author finds that this method of anesthesia has all the advantages of intradural lumbar anesthesia without its disadvantages, and since the method is safe and easy of application, peridural lumbar anesthesia is warmly recommended for extensive use in the smaller gynecological institutions where personnel is scarce and convenience is at a premium.

JOHN W. BRENNAN, M.D.

Cystitis of the Trigone in Women (La cystite du trigone chez la femme). GUSTAV T. HEDBERG. *Acta obst. gyn. scand.*, 1948, 28: Supp. 2.

The author reviews the literature on cystitis of the trigone in women, following which he reports the results of his clinical experience in 300 cases. His anatomical material consisted of 68 biopsy specimens from the vesical trigone, 115 from the mucous membrane of the cervix, and also 83 postmortem specimens from the vesical trigone.

Contrary to existing theories, an analysis of the clinical results showed that hyperemia of the trigone of gynecological origin does not produce any disturbance of urination even in patients with longstanding hyperemia, and it is believed that the trigonal hyperemia caused by pelvic disease does not give rise to trigonitis.

It was ascertained that the true incidence of polypoid protuberances at the neck of the bladder was 24 per cent, which indicates that the presence of these protuberances bears no relation to trigonal hyperemia or urethritis. The author emphasizes the fact that there has been no evidence in the present material which would indicate that the polypoid protuberances give rise to urinary symptoms. Every third woman suffered from chronic urethritis which had no relation to trigonitis or polyps at the neck of the bladder. A generalized hyperemia of the urethral mucosa, which seemed to be a part of the urethrotrigonitis, was observed half as frequently. This form of the condition does not give rise to contractures of the bladder neck. The author states that while pelvic disease and genital activity cause bladder irritability, there is no clinical evidence that it may cause trigonitis, nor is increased urinary infection noted in these cases.

Histologic examination revealed a great increase in subepithelial lymph follicles in the vesical trigone, and it is believed that their presence is increased in patients with trigonitis. The author has observed also a squamous metaplasia of the transitional epithelium of the trigone, showing a marked resemblance to the epithelium of the vaginal mucosa. Experiments with estrogen indicate that the trigone may present the same cyclic phases as those occurring in the vaginal epithelium. Cystoscopic examinations of iodine-stained epithelium of the trigone show the presence of glycogen in these squamous cells of the trigone, and there seems to be a relation between the extension of the metaplasia and the pattern of the trigonal hyperemia. In view of the rich flora of bacteria in the urethra, the author believes that this same pavement epithelium of the trigone is particularly liable to infectious effects.

In conclusion the author states that in his opinion trigonitis is the pathologic reaction to infectious and hormonal influences to which the trigone is submitted. Urinary symptoms other than those caused by urethritis seem to be explained by trigonitis as such, or by a state of irritation in the adjacent internal sphincter, the latter developing as a result of the trigonitis.

JANE C. MACMILLAN, M.D.

Bladder and Ureteral Malformation in Genital Prolapse (Les déformations vésicales et uretérales dans les prolapsus génitaux). G. GUILLEMIN, and H. CAVAILHER. *Rev. fr. gyn. obst.*, 1948, 43: 93.

The authors present a very interesting and practical article concerning the changes in position of the urethra, bladder, and ureters in the various degrees of prolapse, with 9 roentgenograms and diagrams. They have carried out complete urological studies on 60 patients with genital prolapse and have evaluated their findings.

They found that the changes in position of the urethra, bladder, and ureters depended on whether there was a primary prolapse of the uterus with secondary vaginal inversion, or a primary vaginal prolapse with secondary progressive elongation of the cervix. They found two types of cystoceles: a type in which the cystocele was developed at the expense of the preureteric and interureteric zones by their gradual attenuation, and a second type in which the cystocele was formed by the floor of the bladder, the cervix, and the ureters swinging around the lower border of the symphysis. In this second type, particularly, all of the organs rotated below the symphysis. The meatus descended a little, the bladder more, the ureteral orifices and the terminal portions of the ureters likewise, and the uterus descended to the greatest extent. The greater the descent, the more variation in the site of the urethra, which had a greater and greater tendency to become vertical. In introducing a cystoscope, it had to be passed downward from above.

Cystograms of the anterior and lateral views showed the shadow of the bladder to be in the form of a pear, with the broad side uppermost and completely exteriorized below the symphysis when the prolapse was exteriorized. If the prolapse was reduced, cystography often showed a very large bladder, rounded like a small balloon. Sometimes, at the level of the lower pole of the bladder, irregularities could be seen, resulting from folds of the bladder wall.

The cystoscope showed important changes in the base of the bladder. It was seldom easy, and often very difficult, to visualize the base of the bladder. If the prolapse was protruding, it was usually impossible to find the ureteral orifices. The ureters often resembled the mouth of a gland and it was only after injections of indigocarmine that blue dye could be seen coming from the invisible part of the base of the bladder. Upon reduction of the prolapse the ureteral orifices became plainly visible.

The ureters were generally elongated and completely exteriorized beyond the pelvis in roentgenograms made with ureteral sounds in place. Although it was often difficult to catheterize when the prolapse was reduced, the ureters were very easily entered at the moment when the prolapse was produced as the patient strained.

Uroselectan was employed in every case to evaluate the degree of ureteral and kidney pelvis dilatation and at the same time to study the renal function in the aged women. In contrast to most autopsy reports, the authors found no case of ureteral construction with dilatation above. Bilateral hydronephrosis was only present in 1 woman of 72 years with a total prolapse, while another patient had a slight hydronephrosis on the right side due to angulation of the lumbar ureter with renal ptosis.

In all 60 cases observed the renal function was normal.

These studies suggest certain operative dangers in the treatment of prolapse. There is danger of injury to the urethra at the time the anterior vaginal wall is opened, danger of injury to the bladder when the bladder is freed from the cervix, and, especially, there is danger of injury to the ureters when the lateral attachments of the bladder are freed.

CRAIG W. MUCKLE, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Death Following an Autotransfusion (Todesfall nach Reinfusion). E. E. MANUELIDIS. *Geburtsh. & Frauenh.*, 1948, 8: 431.

The author reports the case of a death which followed an autotransfusion. The patient had suffered a massive intraperitoneal hemorrhage from the rupture of an ectopic pregnancy. The blood was recovered from the peritoneal cavity, mixed with sodium citrate and Ringer's solution, filtered, and administered by venoclysis. The patient soon became jaundiced, anuric, and dyspneic. Stupor and death with azotemia followed. The complete autopsy protocol revealed only a tubular blockade by acid hematin as the cause of death.

Only 3 other similar cases have been found in the literature, according to Manuelidis. He suggests that in some cases the blood, leaving its normal intravascular habitat, may undergo degenerative changes which release hemoglobin. From a clinical viewpoint, there is no rapid way of determining which bloods have been so changed. It is implied that, although this accident is rare, autotransfusion is not a procedure of choice.

WILLIAM C. BECK, M.D.

LABOR AND ITS COMPLICATIONS

Cesarean Section at the Boston City Hospital, from 1936 to 1946. DANIEL J. MCSWEENEY and ARTHUR J. HASSETT. *N. England J. M.*, 1948, 239: 254.

Hemorrhage and sepsis are the most common causes of mortality following cesarean section. Whole blood given early, rapidly, and copiously is the only way to combat hemorrhage. Too often, transfusions are given too late, too slowly, and in too small amounts. Cesarean section must not be done in the presence of shock. Shock must first be treated as expeditiously as possible. One must be sure there is no chance for secondary hemorrhage either from uterine atony or from improper hemostasis before the abdomen is closed.

Cesarean section has a distinct place in the treatment of toxemia and does not add to the risk particularly if it is done under local or sodium pentothal anesthesia.

There is no limit to the number of cesarean sections that a patient may undergo, provided sufficient attention is given to the uterine scar both before and at operation.

The danger in cesarean section after rupture of the membranes and prolonged labor is sepsis. Therefore, every patient in whom cesarean section is probable when given a test of labor should receive sulfonamides and penicillin prophylactically after the first 12 hours. In the frankly infected cases the extraperitoneal operation should be done.

Cesarean section in women with heart disease offers no advantage over delivery through the pelvis and should not be done unless there is some other indication.

Anesthesia for cesarean section must be administered by a trained anesthetist, especially if spinal anesthesia is used.

With proper attention to these suggestions the mortality for cesarean section should be kept below 1 per cent.

CHARLES BARON, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Secondary Effects of Penicillin During Pregnancy and the Puerperium (Efectos secundarios de la penicilina durante el embarazo y el puerperio). G. COLMEIRO-LAFORET. *Rev. espan. obst.*, 1948, 5: 148.

On administering various forms and quantities of penicillin to the pregnant patient for different causes, the following secondary effects were recorded:

1. Of 11 patients in the first trimester, 4 experienced light pains (1 with a slight hemorrhage), 6 showed no disturbance, and 1 aborted. Eight of these patients had gonorrhea, 2 had pyogenic infections and the patient who aborted was luetic.

2. Of 5 patients in the second half of gestation, 4 experienced no effects and 1 patient had slight pains.

3. Of 10 patients treated during delivery and the puerperium, 4 had no untoward results, 3 experienced major hemorrhage in the lochia, 2 had a diminished milk secretion, and 1 patient had metorrhagia. These patients were treated for infections of the genital organs, puerperal parametritis, and mastitis.

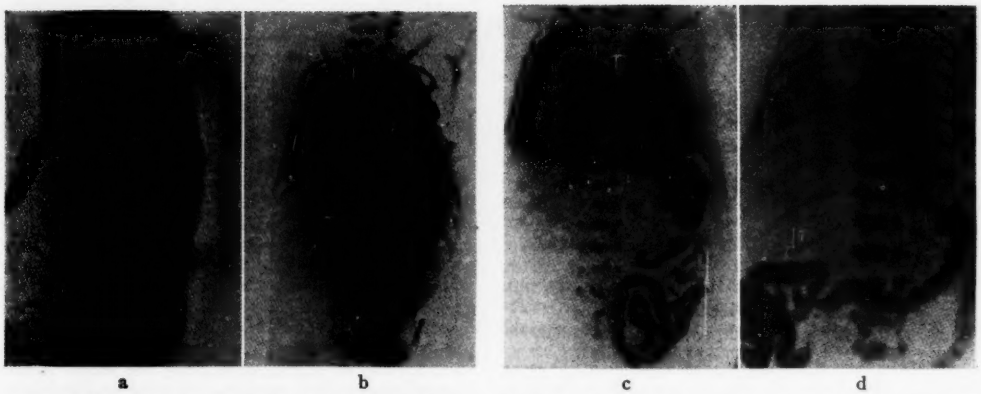
From the study it is believed that penicillin therapy is capable of producing uterine contraction in some instances, and this possibility must be reckoned with to avoid abortion. Furthermore, it is stated that the lochia is increased and the secretion of milk is diminished by the administration of penicillin.

STEPHEN A. ZIEMAN, M.D.

NEWBORN

Diaphragmatic Hernia as a Problem of the Obstetrician. Diaphragmatic Hernia in the Newborn (Ueber die Zwerchfellbruche als Problem des Obstetrikers. Ueber die Zwerchfellbruche bei Neugeborenen). OLAVI KINNUNEN. *Ann. Chir. gyn. fenn.*, 1948, 37: 193.

The author reviews the embryology, classification, clinical picture, diagnosis, and treatment of congenital diaphragmatic hernia. When there is a diaphragmatic defect which permits the abdominal contents to enter the thorax, the condition is known as a false diaphragmatic hernia; when there is merely



a b c d

Fig. 1 (Ginglinger). Fetography by amniography. a, Fetus, third month; stomach and small intestine. b, Fetus, fourth month; lungs, small intestine, stomach. c, Fetus, fourth to fifth month; stomach, small intestine, lungs. d, Fetus, fifth to sixth month; cecum and colon (thorotrast and umbrathor).

a weak spot with sac formation, a true diaphragmatic hernia is present. Among 1,363 newborn infants who were examined after death during the years from 1928 to 1947, 11 had false diaphragmatic hernias, often with other anomalies. All of the infants were stillborn or died soon after delivery.

One should consider such a diagnosis in cyanosis of the newborn. Roentgenologic confirmation is necessary for the establishment of a definite diagnosis, but with the heart clinically displaced to the right, tympanitic percussion note and faint breath sounds over the left hemithorax, sucking in of the lower thorax and epigastrium with inspiration, and hepatomegaly, diaphragmatic hernia must be considered.

The author suggests that if the diagnosis can be made early and the general condition of the child permits, operative correction may be feasible in some instances. WARREN R. LANG, M.D.

MISCELLANEOUS

Radiodiagnosis in Gynecology and Obstetrics. Radiodiagnosis in Obstetrics (Le radiodiagnostic en gynécology et en obstétrique. Le radiodiagnostic en obstétrique). A. GINGLINGER. *Gyn. obst.*, Par., 1948, 47: 481.

The author presents a comprehensive report of the use of roentgenography in normal and pathologic pregnancy.

Except in cases of excessive obesity, the fetus can be recognized in the roentgenogram with certainty in the sixteenth week of pregnancy, although, in favorable cases, roentgenologic diagnosis is possible as early as the twelfth week. Roentgenography following the injection of lipiodol in the uterine cavity gives a characteristic picture as early as the sixth week of pregnancy. Although the risk of abortion seems to be small, hysterography should be performed only in cases in which interruption is indicated. The author believes that roentgenography during the first half of pregnancy is of little practical interest in view of the dependability of the biologic tests.

During the second half of pregnancy, roentgenography has been used to determine the presentation, position, attitude, age, and sex of the fetus; however, because of individual variability, determination of the age according to the development of the ossification centers around the knee is not free of error. Another method of the determination of age is measurement of the fronto-occipital diameter. Some authors have attempted to determine the sex of the fetus by roentgenography of the fetal pelvis shortly before term.

Whereas all these methods are of little practical value, roentgenography is more helpful for the diagnosis of multiple pregnancy, especially in cases of polyhydramnios, although errors of diagnosis may occur even with the most modern equipment.

Furthermore it is believed that fetal malformations and monsters can be recognized in the roentgenogram as well as other defects such as hydrocephalus, anencephalus and spina bifida. Death of the fetus can be diagnosed by abnormal flexion, lordosis, gibbus of the vertebral column, or abnormal position of the extremities caused by hypotony of the skeletal muscles. Another sign of death is the "aureola" around the skull due to separation of the skin and adipose tissue from the cranial bones.

The differential diagnosis of tumor and pregnancy, or the coexistence of both can be seen in the roentgenogram, as well as ectopic pregnancy in its later stages. In certain cases of hydatid mole, hysterography, after the injection of lipiodol, is an aid in establishing the diagnosis.

The injection of opaque substances in the amniotic sac is without danger and permits visualization of the placenta and the soft parts of the fetus, es-

pecially the lungs and the gastrointestinal tract. The injected contrast substance is rapidly eliminated by the maternal kidneys.

The injection of opaque substances in the maternal circulation as a means of visualizing the placenta is still in the stage of animal experiment. In cases of low insertion of the placenta or suspected placenta previa, direct roentgenography of the uterus after filling the bladder either with air or with contrast substances will confirm the diagnosis. The author states that roentgenographic study has increased considerably our knowledge of the mechanism of birth, and of descensus and expulsion in the different presentations. The injection of barium sulfate in the umbilical vein immediately after delivery permitted study of the mechanism of separation of the placenta.

In conclusion the author states that great progress has been made in pelvimetry. Several methods of measuring the obstetrical diameters directly by roentgenography are described. Stereoscopic radiography has become very valuable in the diagnosis of dystocia of bony origin and enables the obstetrician to decide early between cesarean section and forceps delivery. WERNER M. SOLMITZ, M.D.

Comparative Physiology of Fertilization and Its Application to the Study of Sterility in Man (Physiologie comparée de la fécondation et applications a l'étude de la stérilité humaine). R. MORICARD. *Gyn. obst.*, Par., 1948, 47: 411.

This article is a brief summary of our knowledge concerning the physiology of fertilization, especially the influence of chemical substances and hormones on maturation and fertilization.

The oocytes of plants and certain lower animals (echinoderma) produce a substance, "fertilizin," which attracts specifically the spermatozoa. In echinoderma, frog and rabbit proliferation of the nonimpregnated ovum can be produced with testicle extract or certain chemical compounds.

Experiments in mammals (dog, rat, guinea pig, and monkey) prove that the pituitary is necessary for normal spermatogenesis. In hypophysectomized animals, the injection of pituitary gonadotropic hormone restores normal spermatogenesis, whereas chorial gonadotropin fails to re-establish maturation. Vitamins E and A seem to play a role in spermatogenesis.

A certain concentration of spermatocytes in the semen is necessary to secure fertilization. In the rabbit, at least 1,000,000 spermatozoa per cubic centimeter are required for constant fecundation; if the amount is less than 10,000 per cubic centimeter sterility occurs. In addition to normal spermatogenesis, normal secretion of the prostate is necessary for fertilization. Among the different substances of prostatic secretion, hyaluronidase seems particularly important. In the rabbit, the addition of hyaluronidase to diluted semen permits fecundation. In mammals fertilization occurs in the tube generally; the nature of the tropism causing the ascent of the spermatozoa is unknown.

Zondek showed in 1926 that it is possible to provoke follicle development in the prepuberal mouse by implantation of pituitary tissue. In female rats, hypophysectomy and the injection of gonadotropin produce analogous effects on maturation of the oocytes, as was described for the male. Rupture of the follicle is caused by the influence of gonadotropin, the contraction of the smooth muscle of the follicle wall under the possible influence of estrogen, and a proteolytic ferment which permits the opening of the follicle.

Little is known about the penetration of the spermatozoon into the ovum in spite of many experiments in vivo, after artificial ovulation, or in vitro. The author succeeded in cinematographing the entering of rabbit spermatozoa in the cluster of periovular cells in vitro but failed to observe the passage through the vitelline membrane.

Our knowledge of the physiology and pathology of fertilization in man is quite limited. Penetration of the sperm cell in the ovum has never been observed either in vivo or in vitro. Normal human semen contains 100,000 cells per cubic millimeter, 80 per cent of which are movable. Less than 60,000 cells per cubic millimeter are considered as presenting the condition of oligospermia. In pathologic cases the cells may be immovable, the time for the reduction of methylene blue may be prolonged, and the amount of hyaluronidase diminished.

Various conditions may prevent the ascent of the spermatozoa: changes of the vaginal *p*H which cause rapid loss of motion, increased viscosity of the cervical mucus, endometritis, and occlusion of the tubes.

In conclusion, the author discusses very briefly the treatment of human sterility by artificial insemination, hormonal therapy, and the administration of hyaluronidase.

WERNER M. SOLMITZ, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Renal Trauma. KENNETH M. LYNCH, JR. *J. Urol.*, Balt., 1948, 60: 371.

During a 7 year period, 23 patients with renal injury were admitted to the Charlotte Memorial Hospital, Charlotte, North Carolina. Operation was performed in 30 per cent of the cases, and there were 3 deaths in the series.

Pain was the presenting symptom in 83 per cent of the cases, and the severity of the pain was more or less correlated directly with the severity of the injury. All of the patients presented hematuria. About three-fourths of the group were found to have tenderness in the flank. Rigidity on the affected side was found in 69 per cent of those having ruptures and in 22 per cent of those with contusions. One-third of the patients having renal rupture presented a palpable mass in the flank. Shock was present in 53 per cent of the patients with rupture, and in 33 per cent of those with contusion.

Intravenous urography was performed on 15 patients. There was no function from the injured side in 2 cases; poor filling was observed in 7, and good filling in 6. Seven patients were operated on—nephrectomy being done in 4 cases, drainage in 2, and repair and drainage in 1 case.

The author states that the ruptured kidney which is not explored is subject to a number of sequelae, such as secondary hemorrhage, urinary extravasation, infection, hydronephrosis, stone formation, and calcified cysts of the kidney. He believes that all cases of renal rupture, as established by flat film, excretory urography, or retrograde pyelography should be subjected to exploration, and emphasizes that this should be done early.

JOSEPH E. MAURER, M.D.

Immediate and Remote Descending Pyelography in Renal Contusion (La pielografia discendente nel decorso immediato e negli esiti tardivi delle contusioni renali). GIORGIO DI MAIO. *Arch. ital. urol.*, 1948, 22: 301.

Observations on 16 cases of contusion of the kidneys proved to the author the diagnostic value of descending pyelography. Only in rare cases was it necessary to resort to ascending pyelography.

The employment of the method as soon as possible after the injury offers suggestions as to the choice of surgical procedure and the treatment of complications. In the great majority of cases the early employment of descending pyelography avoids the necessity of using chromocystoscopy or cystoscopy with catheterization of the ureters. A repetition of the method at certain intervals offers the opportunity of studying the anatomic and functional evolution of the ureteropyelorenal lesion.

The early employment of the method is not connected with any danger. It discloses the existence, if any, of malformations or other pre-existing lesions, such as lithiasis or hydronephrosis.

The limited number of observations does not allow any definite conclusions as to the effect of contusion of the kidney on the rapidity of appearance of the contrast medium, intensity, and duration of the secretion. In many instances the contrast medium appeared within 3 to 5 minutes after the intravenous injection in the presence of a grave renal contusion. In cases of medium gravity the elimination of the dye was abnormally prolonged.

Renal ptosis, periureteropyelonephritis, pyelectasia, and other conditions may be disclosed by pyelography at certain intervals after the injury and thus may contribute to the employment of conservative surgical measures.

In many instances the roentgenologic exploration obviates the necessity of a surgical exploration.

JOSEPH K. NARAT, M.D.

Pyelitis Glandularis. GEORGE L. TORASSA, JR. *J. Urol.*, Balt., 1948, 60: 393.

The fourth case of pyelitis glandularis is reported. It was discovered in a 46 year old negro who underwent nephrectomy for a nonfunctioning kidney which contained a staghorn calculus. Histologic study revealed the presence of mucous glands in the renal pelvis, similar to those in the colon; goblet cells actively secreting mucin were present; lymphoid follicles were numerous.

In all 3 previously reported cases, calculi were present. The question is raised as to whether this condition is a metaplasia or whether pre-existing fetal cell rests have been stirred to activity. Metaplasia can be seen in the same microscopic section in some cases of cystitis glandularis showing the change from transitional to columnar, and then to true glandular epithelium. Squamous anaplasia may also be present. Many workers believe that chronic irritation is the cause of the metaplasia.

The cell rest theory also has appreciable evidence in its favor, for the ureteric bud arises from the cloaca. This common origin of the epithelium of the urinary tract and the bowel makes very real the possibility of a dormant fetal rest being stirred into activity by chronic irritation.

The author considers the danger of this glandular lesion undergoing malignant degeneration, whether it be in the kidney, ureter, or bladder.

JOSEPH E. MAURER, M.D.

Renal Decapsulation in Mercury Nephrosis. C. W. VERMEULEN and C. R. SNEAD. *J. Urol.*, Balt., 1948, 60: 216.

The present study was made in order to determine the value of renal decapsulation in anuria and uremia due to experimentally induced mercurial poisoning.

Female dogs were used in the study. After an initial determination of the function of each, a solution

of mercuric chloride was injected intravenously in doses varying from 1.8 to 4.4 mgm. per kilogram of body weight for 1 or 2 days. One or two days later the right kidney of the animal was decapsulated under ether anesthesia. The capsule was split along the convexity of the kidney and the capsular flaps were allowed to retract. The function of each kidney was studied daily until either death or recovery of the animal took place.

The authors describe the surgical technique they use to collect the urine and estimate the function of each kidney.

A total of 32 dogs were poisoned with mercury. Fifteen animals showed significant changes in renal function and they survived both poisoning and decapsulation for a sufficient length of time to draw conclusions as to the effect of unilateral renal decapsulation. In none of the fifteen animals was there any evidence that the decapsulated kidney functioned better than its control mate.

Following mercury poisoning, the excretion of phenolsulfonphthalein by each kidney in every dog was almost identical day by day, even though one of the kidneys had been decapsulated.

The observations made indicated that in a dog (at least if renal function became impaired to the extent that the excretion of the phenolsulfonphthalein had been decreased and the blood urea nitrogen became elevated), the ordinary course of events was death due to uremia.

In no instance did a comparison of the renal function of a poisoned dog suggest that the decapsulated kidney was able to excrete urine of better quality or quantity then the undecapsulated control kidney.

The authors suggested that there was nothing to indicate that the human kidney behaves differently from that of the dog in this respect.

They concluded that in their opinion this experiment did not lend support for the clinical use of decapsulation in uremia due to mercury poisoning.

CONRAD A. KUEHN, M.D.

Wounds of the Ureter Caused by Firearms (Les blessures de l'uretère par armes a feu). L. KOJEN and S. PETKOVIC. *J. Urol. méd.*, Par., 1948, 54:128.

Trauma to the ureter is rare, because of its small size, elasticity, and great mobility. Subcutaneous rupture of the ureter is encountered from time to time in civil practice. Wounds made by sharp instruments are also exceptional and are seldom observed in time of peace. Wounds by bayonet have given way to wounds caused by firearms. Wounds of the ureter are uncommon in times of peace, and very few cases have been found in the literature between the interval of the two wars.

The author was not able to observe a sufficient number of cases following the war to have a great deal of personal experience with this type of injury. During the war of 1914-1918, Decoulx collected 15 cases of wounds of the ureter; Legueu cited 5 cases of Marion, 2 cases of Cathelin, and 1 case of Rochet; and the author adds 3 of his personal cases.

Walker found 2 cases of isolated wounds of the ureter in the American Army and 2 cases in the British Army during the war of 1914-1918. Fronstein and Epstein found 4 cases of urinary fistula in the Russian Army resulting from wounds of the ureter complicated by intraperitoneal wounds, which rapidly resulted in death, reported as having occurred in the German Army during the 1914-1918 war. Kuemmell, Fritsch, Rehn, Koerte, Stutzin and Gundefinger, Kolb, and Laewen each observed a patient with a ureteral wound. Recently, Grube saw a biliary and ureteral fistula following a firearm wound. Kimbrough described 8 cases in the American literature, Prather 3, and Lewis 1 case of wounds of the ureter caused by firearms, during the past war.

The ureter is a very small organ and is rarely wounded. Its great mobility permits it to escape a projectile of a certain velocity. Wounds of the abdominal organs from firearms are frequent enough so that wounds of the ureter are bound to be more frequent than published reports would indicate. In this regard, wounds of the ureter are like wounds of the kidney during war.

In the front line surgical ambulances, wounds of the kidney are more frequently found than they are found in the hospitals in the rear. Wounds of the kidney as well as of the intraperitoneal organs are very dangerous. The wounded die on the battlefield or in the front line ambulances.

On the contrary, isolated wounds of the kidney or those complicated by less serious wounds are seen in the hospitals to the rear. A large number of cases of wounds of the ureter are accompanied by wounds of the abdominal aorta and the inferior vena cava, and result in immediate death.

The author groups the wounds of the ureter caused by firearms during the time of war as follows:

1. Wounds of the ureter complicated by grave wounds of the large vessels, abdominal aorta, inferior vena cava, intraperitoneal organs (liver, spleen), or intrathoracic organs. The complications of these wounds result in immediate death on the field of battle.

2. Wounds of the ureter associated with wounds of the hollow intraperitoneal organs or of the peritoneum which mask the wound of the ureter. The ureteral wounds are diagnosed at emergency operation because of the intraperitoneal aspect of the wound. Sometimes the operation reveals the wound of the ureter, and at other times the wound of the ureter escapes notice. It is only when a urinary fistula develops that the wound is discovered.

3. The solitary wound of the ureter is rare and most interesting to the urologist. This injury is seen 1 or 2 days after the accident or later when a urinary fistula develops.

The author believes that the experience of any one urologist is very limited with this type of case. The accumulated cases should be studied in order to determine the best operative procedure.

The circumstances surrounding the trauma, the pathology of the ureter, and the operative possibili-

ties are very different if the injury is due to an operative involvement of the ureter or if the injury is acquired on the field of battle. On the one side we find the operating room, the aseptic wound, the early diagnosis in the case of dissection of the ureter during the course of operation, and on the other, we have the field of battle, the infected wound, and complication of the pelvic organs. Late diagnosis suggests the essential difference between the two types of ureteral wounds.

The author concluded that wounds of the ureter are rare in time of war as well as in time of peace. Very often they are masked by wounds of neighboring organs or by the pelvic wound. They are discovered at a later date when a urinary fistula develops in the lumbar region.

The author reported 3 cases of injury to the ureter.

In the first case a man of 20 years of age was wounded on April 15, 1945 by a machine gun bullet in the left side of the perineal region. He developed a urinary fistula with pain in the flank and afternoon fever. A left nephrectomy was performed on September 27, 1945.

The second case was that of a patient 19 years of age, who was wounded by mortar fire on December 12, 1944. The wound involved the right lumbar region. The patient developed pus in the urine and a small lumbar fistula, and retrograde pyelography showed the projectile at the tip of the ureteral catheter with a functionless right kidney. On September 15, 1945 a right nephrectomy was done.

The third case was that of a 19 year old man wounded September 28, 1944 by a machine gun bullet which entered the right buttock. Cystoscopic examination showed stenosis 4 cm. above the bladder on the right side and a functionless right kidney. On September 29, 1945 a right nephrectomy was done.

The author included diagnostic pyelograms of the cases presented and discussed each case at length.

In discussing the treatment, he observed that it was difficult to apply conservative treatment in this type of injury because it was almost impossible to make an early and exact diagnosis. The late alteration of the wall of the ureter and the periureteral tissues, and also the suppuration of the renal parenchyma do not permit hope for a good result from conservative treatment. He outlined the following methods of treatment:

1. Indwelling ureteral catheter
2. Suture of the incomplete ureteral tear
3. Suture of the wall of the complete tear in the ureter
4. Implantation of the superior end of the ureter into the bladder
5. Débridement—simple or extensive without disturbing the ureter
6. The radical operation, nephrectomy.

The indwelling catheter may help to close the ureteral fistula. Desnos and Le Fur have reported a case in which this type of treatment was used, but they did not make a follow-up examination.

Suture of the incompletely severed ureter can rarely be done. Late suture is impossible, and it may be better to use an indwelling ureteral catheter; this will permit the urinary fistula to close and also maintain the caliber of the ureter.

Suture of the completely severed ureter has been recommended by some authors, but again, without much success. Late diagnosis and alteration in the wall of the ureter and the periureteral tissues are the principal factors that contraindicate this type of treatment.

Some authors report successful suture of the ureter and give as proof the closure of the urinary fistula, but this closure is at the same time associated with atrophy of the kidney. The proof of the success of suture of the ureter is not complete without ureteral catheterization, pyelography, and evidence of good elimination of the urine from that side.

The reimplantation of the torn ureter in the bladder is an excellent procedure, but the diagnosis must be made very early. Later, the alteration of the structure does not always permit sufficient mobilization of the ureter for this type of operation. Lewis, on the contrary, implanted the superior end of the ureter into the bladder 6 months following injury and obtained proof by intravenous urography of good kidney function and recession of the hydronephrosis on the wounded side.

Nephrectomy is the treatment applied most frequently. It is done at the time as an emergency procedure; later, it may be done because of alterations in the kidney as well as in the ureter. Often there is no chance to save the organ because nephrectomy is done as an emergency procedure in a gravely injured patient. Later, the operation is again rendered difficult and dangerous because perinephritis and periureteritis compress and surround the organs.

The complete débridement of the wound is necessary the first day or two after the wound has been made. Later, it is of value to do this procedure in the treatment of urinary phlegmon.

In résumé, the author stated that conservative treatment of the wounded ureter can rarely be applied. There is little chance for anatomical and functional conservation of the organ. Nephrectomy is often the only surgical procedure for emergency treatment as well as delayed treatment of the ureteral injury from firearms. CONRAD A. KUEHN, M.D.

BLADDER, URETHRA, AND PENIS

Operation for Excessive Bladder Hypertrophy. E. G. CRABTREE and S. RICHARD MUELLNER. *J. Urol.*, Balt., 1948, 60: 593.

The authors consider the persistence of bladder atony with retention of large amounts of residual urine after adequate prostatectomy. Such poor clinical results are puzzling, and further excisions of tissue in the posterior urethra or at the bladder neck are often futile.

In the absence of neurogenic vesical disturbance, such failures, it is contended, are due not to con-

tinued obstruction, but rather to a changed bladder muscle. Loss of detrusor tonus is due to marked proliferation of fibrous tissue at the expense of the smooth muscle. Two major histological changes are found: (1) an increase in the pre-existing fibrous tissue which normally surrounds the muscle bundles, and (2) new areas of connective tissue which replace degenerating muscle either wholly or in part. The cause of such scarring is not clear.

In nonsurgical rehabilitation of such bladders, prolonged catheter drainage is suggested in less severe cases. The administration of large doses of testosterone enhancing the tonus of the bladder muscle may shorten the drainage period. As a surgical measure, an operation excising two-thirds of the mobile part of the bladder is described, and it is hoped that the islands of smooth muscle may regenerate in the remarkable way that bladder musculature does. The small remaining bladder is closed around a cystotomy tube and the obstructive factor is dealt with appropriately. The viscus tends to regenerate to normal size and empty fairly satisfactorily.

Several brief abstracts of cases are cited in support of the points brought out.

ALLAN K. SWERSIE, M.D.

The Importance of Information Furnished by Preoperative Urethrography and the Results of Urethrotomy on the Immediate Repair of the Urethra, in the Course of Diffuse Perineal Phlegmon (Importance des renseignements fournis par l'urétrographie pré-opératoire, et resultats de l'urétrectomie et de la réfection immédiate de l'urètre au cours des phlegmons diffus du périné). L. SABADINI. *Mém. Acad. chir.*, Par., 1948, 74: 515.

The frequency of diffuse or circumscribed perineal phlegmon is high in Algeria. "It is no wonder," the author stated, "that urethral pathology is given so much attention in our country." He regarded the so-called "classic treatment" as insufficient, incomplete, routine, and old fashioned.

The usual treatment for diffuse perineal phlegmon was described as follows:

After a brief history is taken to determine if the patient has urinated or not or if he has had a urethritis or stricture, he is placed on the operating table. A long incision is made from the root of the penis into the scrotum; it bisects the scrotum and thus opens the perineum. The finger explores all of the various tracts and tissue planes. If the tissue is copper colored, gaseous, or edematous, and the process extends to the abdomen, suprapubic incisions are also made.

Following surgery, treatment with local antiinfectious agents, antigangrenous serum, sulfonamides, and penicillin is instituted.

The scrotoperineal incisions are dressed. Local and general intense antibiotic treatment is indicated.

After the operation, the patient often voids through the perineum and he is continually wet with urine. The tissues heal very slowly with numerous fistulas, and it usually takes many weeks for complete healing. The acute phase then subsides, but a chronic periurethritis with stricture formation still exists.

The author makes a preoperative urethrogram, contrary to the present accepted procedure, in all cases of perineal phlegmon, diffuse or localized, gangrenous or not. He stated that urethrography from a practical viewpoint shows:

1. The site and extent of the stricture.
2. The extent of the infiltration, whether it is a simple periurethral infiltration or a large one extensively involving the perineum.
3. The site of the periurethritis (and thus the site of the lesion can be demonstrated by this method). This provides an important sign for the operator, for it shows him whether the lesion is in the angle of the penis or in the bulb.

These observations are important, for one can see the causal lesion and determine its extent. Through the information thus gained in the course of surgery, it can be seen that the usual simple operative opening in the perineum may result in a fatality, because it is not adequate for the amount of drainage that is necessary.

From a speculative viewpoint, the preoperative urethrography in the course of perineal phlegmon tends to prove Voillemier's contention that there is an infiltration of urine into the perineum and pelvis which is associated with a diffuse perineal phlegmon. This is demonstrated by the diffusion of the contrast media during a perineal phlegmon. The diffuse invasion of the perineum by urine follows the efforts of the bladder working against an obstruction to force out urine drop by drop into the periurethral openings. The site of the pelvic cellulitis has for a long time been thought to be associated with the infiltration of urine following either a perineal phlegmon or a periurethritis.

In practice, the urethrography permits one to see the signs of pelvic infiltration of urine visible at the same time as the perineal infiltration of urine. By this method, one is able to see how the pelvioperineal diffusion is produced. The pelvic floor and the perineal aponeurosis are not a partition. In the perineum and pelvis there are openings for vessels, nerves, and lymphatics and these openings provide a way for the infection to spread.

At surgical intervention one is surprised to find the bulb, the anobulbar raphe, the rectourethral space, the site of the edema, and lacerated, gangrenous and sanious tissues all involved in this destructive process. Here again, urethrography in the course of perineal phlegmon gives important information concerning not only the site of the lesion but its possible diffusion as well. It suggests the operative procedure.

The author first makes a urethrogram before any surgical intervention is done, and then continues as follows:

1. In the case of a diffuse perineal phlegmon confined to the perineum a cystotomy with retrograde catheterization of the urethra is primarily done. An

Fig. 1 (Sabadini). Preoperative urethrograms. Urethral opening; massive perineal diffusion of contrast media.

Fig. 2 (Sabadini). Urethrogram showing the healed urethra.

incision is made from the penoscrotal angle to the anobulbar raphe with the electric bistoury. The scrotum is separated into two halves. The infected, gangrenous, blackish tissue is removed with the electric knife. The urethra is splinted with a catheter. If it is not possible to catheterize the urethra with one catheter, it may be necessary to use two catheters, one catheter placed by the retrograde method through the cystotomy incision, and the other through the urethra by means of an incision over the strictured area between the two catheters. In this way, the patency of the urethra can be established. The postoperative treatment consists of the administration of antigangrenous serum and large doses of penicillin for several days after the temperature has subsided and there is a general amelioration in the patient's symptoms. Locally, dressings with antigangrenous serum, immediate injection of penicillin through the drain, and, later on, Dakin's solution provide the local treatment. After the patient has recovered completely, his care is the same as that of any other patient having a urethrotomy.

2. In diffuse perineal phlegmon spreading to the hypogastrium and the abdomen the technique differs as to the establishment of the cystotomy. The risk of dissemination of the hypogastric infection into the prevesical tissue must be considered. The perineal intervention is then conducted as indicated with more incisions and counter incisions for adequate abdominal drainage. To avoid the constant passage of urine from the urethral opening, a Malecot or a de Pezzer catheter is placed in the bladder. In 5 or 6 days, or in a week, it is possible to traverse the abdominal wall without risk of disseminating the prevesical infection. It is advisable then to do a cystotomy to divert the urinary stream, and replace the catheter by a rubber splint so that the urethra can reform around it. The author warns that the usual antibiotic medication should not be discontinued with this type of delayed cystotomy for the danger of disseminating the infection does not pass for 3 or 4 days.

3. In the diffuse perineal phlegmon that is associated with pelvic phlegmon the preoperative urethrogram is of great advantage for the invasion of the pelvis is then always recognized. The operative intervention is conducted then with greater precision. The vesical, perineal, and urethral steps are the same as in all diffuse phlegmons. They permit the bulb and the anobulbar raphe to be opened with the escape of foul, serous drainage. The rectoprostatic space is widely opened, for this space is distended by the same edema that is present in the rest of the tissues and it represents a serious complication. The fingers explore all of the tissue planes. It is very important to pay particular attention to the side of the rectum and the base of the bladder. The exploration of the lateral sides of the prostate and of the entire membranous urethra should receive special attention. Wicks and drains are left in the retroprostatic cavity and the incision should remain open in its entirety. The postoperative care is the same as that for any perineal phlegmon. It is important to establish pelvic drainage with intermittent

irrigations of penicillin and, after 3 or 4 days, to change the penicillin to Dakin's solution.

The author summarizes his experience with more than 50 cases of perineal phlegmon in which he did immediate urethrotomy and in which he made urethrograms prior to surgery. He reported 7 deaths. These deaths usually occurred from 3 to 5 days after surgery, and they usually occurred in those patients who had diffuse gangrene and a very poor general condition with marked toxicity.

In the patients that survived, the general condition improved rapidly with local excision of the gangrenous tissue, and the large operative incisions healed rapidly. The urethra reforms spontaneously over a rubber tube. Occasionally the process could be hastened by suturing of the newly formed tissue about the tube. Usually the healing of the perineum and urethra took place about the same time, in from 45 to 60 days. The small fistula in the bulb persisted occasionally. If the fistula persists for a long time, the caliber of the urethra should be increased by replacing the tube by means of passage of a sound following the closure of the bladder, and if the patient is then unable to void, a sound should be passed 2 or 3 times a day with great precautions to insure asepsis and gentleness. The catheter can be replaced during the night if the nocturnal micturitions are frequent. After healing, these patients should return in 2 months for urethral calibration.

CONRAD A. KUEHN, M.D.

GENITAL ORGANS

Blastomycosis Involving the Prostate. MORRIS MOORE and LAWRENCE K. HALPERN. *J. Urol.*, Balt., 1948, 60: 612.

The thought that blastomycosis might be a causal agent in disease of the prostate rarely presents itself. In 1911, Shepherd and Rhea reported prostatic involvement in a generalized systemic spread of the infection, discovered at autopsy. Later, several other authors described evidence of blastomycosis in the prostate, found at autopsy. Prior to the present report, 2 cases were cited in which this disease was discovered, during life, to involve the genital tract by the presence of characteristic fungus cells in the sediment of centrifuged urine, or in the material from the prostate and seminal vesicles. In both instances, urological complications were preceded by characteristic expectoration of mucopurulent blood-tinged material and cutaneous lesions.

The authors present 2 cases of their own. In the first case, the initial symptoms were prostatic and the patient was treated with massage. Following this stimulation of a prostatic focus, cutaneous lesions developed. Blastomyces were identified in examinations of prostatic secretion, of urine, and in the dense inflammatory infiltrate of tissue blocks from verrucous lip lesions. In the second case, a prostatectomy was done for urinary complaints. Sections of the gland were reported to contain numerous focal abscesses. The patient, who presented a serious cardiac condition, had a downhill course. At autopsy, histological studies showed blastomycosis in several organs. A review of the previously examined sections of the prostate revealed that the focal abscesses contained zymonema dermatitidis, the cause of blastomycosis. The authors stress the importance of examining sections containing abscesses or tuberculoid formations with higher magnifications in order to discover, or rule out, infecting organisms, especially fungi.

It is conceivable that prostatic blastomycosis, in the absence of cutaneous lesions or characteristic cough with blood-tinged expectoration, may go unrecognized.

ALLAN K. SWERSIE, M.D.

Considerations on the Present State of Prostatic Surgery (Considerazioni sullo stato attuale della chirurgia prostatica). VITTORIO GIONGO. *Policlinico*, sez. prat., 1948, 55: 1048.

Seventy-four patients with prostatic conditions were received at the Ospitali Civili di Brescia, Italy in the period from August 1, 1946 to May 31, 1948. Of these, 3 refused operation and 1 was adjudged inoperable; the remaining 70 were operated upon. The method of Freyer was used in 9. These were from 55 to 84 years of age. Preoperative azotemia was 0.60 per thousand, and the largest adenoma weighed 260 gm. Epididymitis occurred in 2 cases, and the average time of incapacity was 40 days. All of the results were good. Hey's operation was utilized in 3 cases. The patients were from 65 to 71 years of age with preoperative azotemia of 0.60 per thousand. The adenomas weighed 10, 15, and 17 gm., respectively. There was 1 case of epididymitis and the periods of incapacity averaged 18 days. The results were excellent.

The Wildbolz perineal prostatectomy was employed in 20 patients. These patients ranged from 71 to 83 years of age, with azotemia of 0.85 per thousand. The largest amount of tissue removed weighed 80 gm. There was one rectoperineal fistula which developed on the ninth day after the operation and closed spontaneously on the forty-first. The average incapacity was 29 days. Nineteen of these patients were cured entirely and 1 was left with urinary incontinence. Millin's retropubic prostatectomy was chosen in 26 of the patients. These ranged from 55 to 79 years of age with azotemia of 0.80 per thousand. The heaviest adenoma removed weighed 105 gm. In 6 cases urine continued to escape from the suprapubic region and the catheter had to be reintroduced for from 4 to 6 days; in 1 case turbid urine persisted for 4 months after the operation. The average period of incapacity was 21 days. All of the patients were cured. Finally, the transurethral resection was done in 12 patients. These ranged in age from 47 to 86 years. The average azotemia was 0.92 per thousand. The largest amount of tissue removed by this method weighed 48 gm. There were no complications, and the average incapacity was 15 days. All of these patients left the service urinating easily, with a residual urine of from

0 to 20 gm. There was not a single death in the entire group.

As might be expected, the Freyer method was chosen for the largest prostate glands and those most difficult to manage, the aseptic method of Hey and the retropubic method of Millin being reserved for those patients with smaller, more easily enucleable tumors and in the absence of infection. Wildbolz's method was reserved for the smaller adenomas and for the older patients, representing a poorer risk, and for those patients in the younger group in whom enucleation by this route seemed practicable and who did not object to the greater threat of permanent sexual impotence.

The author believes that the generally good results attained in these cases are due to the fitting of the various procedures to the pathological conditions encountered, and that the constant adherence to one method would result in the necessity for a greater selectivity (in this group operation was done in 98.6 per cent of all cases) in the choice of cases for operation or the results would not be so good.

JOHN W. BRENNAN, M.D.

Undescended Testes. EDWARD W. BEACH. *J. Urol.*, Balt., 1948, 60: 623.

The author surveys the subject of undescended testes comprehensively, and stresses the importance of early recognition of the problems involved, and of the application of intelligent hormonal and surgical measures as indicated.

Differentiation is made between the larger group of undescended testes, in which the retention is caused by anatomic or mechanical obstruction, and the relatively small group in which descent arrest along the normal route is due to hormonal disturbance. To the end of obtaining healthy spermatogenesis, it is necessary to have the testis reposing in the bottom of the sac prior to the onset of puberty. After that stage is reached, the retained gonad undergoes atrophic changes.

Hormonal therapy in the form of chorionic gonadotropin at the age of 7 or 8 years is advocated. Henderson is quoted as recommending a dosage of 500 international units three times weekly for 6 weeks, then 1,000 international units twice weekly for 2 weeks, if descent is manifest. If no progress is noted, the hormone must be stopped because of danger of an irreversible precocity syndrome, and surgery should be considered. The author discusses developmental history of testicular descent, including the role of the gubernaculum as a continuous cord connecting the lower pole of the testicle to the bottom of the scrotum. This structure tunnels through the abdominal wall and fashions the inguinal canal in advance of the gonadal descent. The testicle is pulled down "like a log upon a sledge" into the scrotum.

Anatomic factors associated with testicle retention include spermatic cord difficulties which vary with position of the testis, the greatest problem with elongation being experienced when the organ is lodged in the internal ring. No single cord component was at fault in this series of 46 cases, since diffuse bands and adhesions usually matted the various structures together. As a whole the cord was always adherent to the peritoneum and had to be freed from it on the posterior and lateral walls of the abdominal cavity. The author feels it permissible to cut the vas, if necessary, to gain length. The spermatic artery, however, should not be cut for that purpose because testicular atrophy frequently follows. Some degree of hernia or potential hernia existed in almost every case. In the repair of simple indirect hernia to avoid shortening of the cord, the Ferguson technique was used, which brought the cord beneath all muscle layers, to emerge near the external ring. Coexistence of direct hernia worsened matters because of the necessity of reinforcement of the posterior canal. In these cases the Wyllys Andrews technique of overlapping the external oblique behind the cord was employed.

Orchiopexy was performed 32 times with the use of various standard methods. Orchectomy was done 17 times, always in the presence of a sound contralateral organ. In these cases it was not possible to carry out an adequate orchiopexy and it was believed that removal of the testicle obviated the greater danger of malignancy in maldescent. In unilateral involvement, if the testicle showed gross atrophic changes after the age of 28, it was removed. In bilateral involvement, every effort was made to preserve at least one gonad.

ALLAN K. SWERSIE, M.D.

Testicular Atrophy Accompanying Liver Cirrhosis (Atrofia testicular de la cirrosis hepatica). M. MANUEL. *Dia méd.*, B. Air., 1948, 20: 2069.

The observation has repeatedly been made that patients with cirrhosis of the liver develop an atrophy of the seminiferous tubules with alterations of the interstitial cells. Apparently some relations exist between the hepatosplenic apparatus and the endocrine glands. According to another theory the process of fibrosis may involve, in addition to the liver, also other organs. Such a condition is called "sclerogenic diathesis." The fibrous alterations may be found in the pancreas, genital organs, the thyroid, and adrenal glands. Other theories have been advanced to explain the simultaneous occurrence of cirrhosis of the liver and atrophy of the testes: e.g., hypofunction of the testes caused by a constitutional dysfunction, an untoward effect of the liver on the endocrine glands functionally connected with the testes, and an effect of the diseased liver on the areas of the central nervous system regulating the sex life.

The concomitant occurrence of cirrhosis of the liver and testicular atrophy is not a pure coincidence. Zondek maintains that inactivation of sexual hormones by the liver is caused by the enzyme "estrinase." This enzyme is able to destroy the biologic activity of certain estrogens in vitro. The latter may inhibit the testicular function by impairing the gonadotropic effect of the anterior lobe of the hypophysis.

The testicular atrophy usually develops during the histologic activity of the hepatic lesion.

JOSEPH K. NARAT, M.D.

Orchiopexy. LEONARD PAUL WERSHUB. *J. Urol.*, Balt., 1948, 60: 631.

A critique on orchiopexy is presented, which emphasizes the regional anatomical features and the advantageous aspects of accepted surgical procedures and recent modifications.

Reference is made to McGregor's principle of a "third inguinal ring" which plays an important part in the retention of the testis in the scrotum. This is a gateway to the scrotum and is stated to be situated to one side of the midline, ½ to 1 inch below the upper border of the pubis and external inguinal ring in the adult. Clinically, when one invaginates the scrotum with the finger to feel the external ring, the finger passes through the third ring. Medially the boundary is the root of the penis and suspensory ligament, and laterally it is the ligament of Scarpa. The pursestring suture, placed at the neck of the scrotum through the deep skin fascia and aponeurosis of the external oblique, after placing of the testicle in the lower part, approximates or reconstructs the ring.

The formation of a loose scrotal sac, particularly in those cases in which the sac is small, requires more than blunt finger separation of elastic connective tissue fibers in the scrotum. Vermooten's recently published modification of the Bevan technique in preparation of the scrotal bed is approved. To obtain a bed that will permit the testis to remain, it is suggested that the elastic fibers be divided by knife, over a sponge stick, evaginating the most dependent portion of the scrotum into the wound. The normal elasticity of the scrotal tissue, which tends to push the testis out, is thus counteracted. Anchorage of the testis by the tying of a gubernacular suture outside the scrotal wall is advocated. Traction with an elastic band may be used if desired, but if there has been adequate preparation of the scrotal bed, and freeing of the cord from adhesions, with sufficient lengthening, and pursestring suture at the neck of the scrotum, this should not be necessary.

The author prefers the Bevan technique, with modifications utilizing applied anatomical factors.

ALLAN K. SWERSIE, M.D.

MISCELLANEOUS

Surgical Indications in Genitourinary Tract Infections. ROGERS DEAKIN. *J. Pediat.*, S. Louis, 1948, 33: 357.

The present article deals with the author's concept of pediatric urologic problems based upon 25 years of experience in the management of urological problems in children observed in the St. Louis Children's hospital. The prevention or elimination of infection is a frequent concern to both the pediatrician and the urologist in a great many cases that present urological problems.

Urinary tract infections in infants and children that require urological investigation and surgery constitute about one-tenth of those that are encountered. The remaining 90 per cent, predominantly pyelitis or pyelonephritis, respond to chemotherapy sufficiently well to recover unless repeated recurrences take place. Malnutrition and a history of longstanding or repeated urinary infections are the rule in those cases that do not respond to chemotherapy.

The investigation of a child suspected of having a surgical infection in the urinary tract begins with a careful microscopic examination of the urine. The microscopic and cultural methods of urinary examination are of considerable importance in the management of a child with urinary tract infection.

The presence or absence of residual urine must be determined early in those cases. The initial determination of the amount of residual urine is an important examination, and great care must be taken so that it is accurately done.

Cystograms furnish a permanent record of the bladder contour and capacity. The amount of fluid introduced into the bladder for this purpose will vary with the size and the age of the child. The pictures of the bladder obtained by intravenous urograms may eliminate the need for cystograms in some cases because the former frequently outline diverticula, distortions of the bladder, or vesical foreign bodies. They do not, however, disclose regurgitation into the ureters in the same diagnostic way that a cystogram does. If no residual urine is present, the amount of opaque fluid comparable to that expelled in an average voiding can be used in performing the cystogram.

Intravenous urography is a useful agent for diagnostic purposes. Too much cannot be expected from intravenous urography in all cases. If the renal function is good and no obstruction or stagnation is present, the media may be excreted so rapidly that little information about the kidney architecture can be obtained. On other films, the radio-opaque material will be of insufficient concentration to be of diagnostic importance. The most serious disadvantage of intravenous urography is that the films frequently fail to show minor defects in the kidney, defects that are readily demonstrated by retrograde studies. Intravenous urography is of great value if cystoscopy and retrograde pyelograms cannot be made.

The improvement made in infant cystoscopes in recent years greatly facilitates the urological investigation of children. The superiority of cystoscopy and retrograde pyelography over intravenous urography lies in (1) actually seeing within the bladder and the urethra, (2) being able to catheterize the ureters and to obtain separate specimens of kidney urine, (3) securing differential functional tests from each kidney, and (4) repeating retrograde pyelograms when necessary.

Routine enemas are not used by the author to eliminate intestinal gas. If fluoroscopy or a scout film before radiographic studies reveals too much gas

for satisfactory films, the intravenous or retrograde pyelograms may better be postponed until another time. Intestinal gas does not interfere with retrograde pyelograms as a rule, because of the greater density of the radio-opaque media.

In certain patients in whom these diagnostic procedures and the exercise of the best clinical judgment still leave the diagnosis in doubt, it may be necessary to perform a surgical exploration of the mass in the flank, and to inspect and take a biopsy of the questionable lesion.

The fundamental principle in the management of all surgical complications of infections in the genitourinary tract is the prompt establishment of free drainage and the elimination of all stasis. Every effort must be made to preserve tissues and structures and to restore them to normal function. Plastic or restorative surgery plays an important role in the management of these cases.

Bladder neck and posterior urethral obstructions are divided into those in which the basic factor of the obstruction is neurogenic in origin and those in which a mechanical defect at the bladder neck causes the obstruction. Examples of the neurogenic group include children who have spina bifida occulta, meningoceles, cord tumors, or injuries to the spine resulting in paralyses of the lower extremities with loss of vesical and anal control.

A conservative program of therapy is usually employed in these cases, with particular emphasis upon the control of infection.

The types of obstruction which are most common in children are: contracture of the vesical outlet, congenital valvular obstruction of the prostatic urethra, congenital hypertrophy of the verumontanum, ureterocele, prostatic lobes, and neuromuscular disease.

In both types of obstruction, the same serious complications, i.e., stasis and infection, are present with renal insufficiency as the eventual outcome if these two factors are not successfully combated. The mechanical obstructions are more amenable to surgical correction and therefore offer a better prognosis if they are not too far advanced before operation.

Transurethral resection of bladder neck obstruction can be done by using miniature instruments. At the risk of having to repeat the operation one or more times, it is wise to proceed cautiously and with extreme consideration of these tiny structures rather than to try to remove too much tissue at one time.

Cystostomy does provide adequate drainage and may be advisable if diverticula of the bladder requiring removal are present. The scalpel removal of bladder neck obstruction via a cystostomy is notoriously inaccurate and difficult. Cystostomy has the added disadvantage of delaying the evaluation of vesical neck surgery until the bladder has again become a closed viscus. It has not been proved that an open, and therefore a contracted, bladder may not in fact contribute additional obstruction to the ureters by the pressure of the thickened bladder wall upon the intramural portion of the ureter.

Unexplained ureteral dilatations of a severe degree are sometimes identified as megaloureter or congenital hydroureter. These ureters are usually infected, and as a rule the kidney and ureter are so badly damaged as to necessitate a nephroureterectomy if the condition is unilateral.

Dilatation of the ureter due to mechanical causes falls into two general classifications: (1) those due to extrinsic factors and (2) those due to intrinsic factors. Those due to extrinsic factors consist of aberrant vessels and fibrous or scar tissue bands, and they are usually found at the ureteropelvic junction. This type of obstruction produces constriction of the ureter resulting in urinary obstruction and dilatation, which in turn causes stasis, infection, and renal damage.

Intrinsic obstruction to the ureter implies a disturbance within the ureteral wall or lumen itself, such as stricture, constriction, stenosis, foreign body such as a stone, or a ureteral tumor.

A wide variety of technical operations have been devised to relieve ureteral obstruction. The chief handicap to a successful operation is that many of these ureters have been stretched to almost paper thinness and this makes any form of plastic repair difficult, with an unfavorable prognosis.

Regurgitation of urine upward in the ureter is an interesting phenomenon, both because of its frequency and because of the uncertainty of its origin. A patulous orifice might suggest a purely mechanical origin for the regurgitation; yet urinary regurgitation can occur with orifices that are not patulous and appear quite normal. Many dilated and patulous ureters regain their normal tonus and lose their dilatation if a bladder neck obstruction is successfully relieved. There seems to be some relationship between the response of the bladder wall and the response of the dilated ureter to an operation on the bladder neck. Both the ureter and the bladder respond to the operation in about the same degree.

The ordinary anomalies of the kidney are single or polycystic renal disease, horseshoe, and ectopic kidney. All of these conditions are associated with infection, and pyuria is the presenting sign that leads to the discovery of the anomaly. The surgical intervention in these cases, either in the presence or absence of infection, will depend upon whether surgery will be helpful. Each case has to be handled individually.

Renal tuberculosis in children usually is accompanied by tuberculosis elsewhere. If a proved case of unilateral tuberculosis is encountered, nephrectomy should be seriously considered. It may be, however, that further experience with streptomycin in tuberculosis will warrant a nonsurgical approach to this type of case in the future.

Calculous disease in children is more often a medical or a metabolic problem than a surgical one. Both kidneys are usually involved, and whether the kidney substance itself is riddled with calcium material or the pelvis and calyces are full of stones, surgery is likely to be impracticable and of no avail. If a frag-

ment of stone breaks away and lodges in the ureter, surgical removal of the calculus may be necessary. Rather than risk further mutilation of the kidney by surgery, the control of infection and correction of the metabolic disorders as far as possible may be advisable before surgery is attempted.

Whenever the urologist is confronted with a choice of either sacrificing a kidney, or perhaps a more difficult task of trying to repair it, he should remember that the genitourinary structures of a child exhibit amazing inherent reparative properties, and this may be the determining factor in choosing a more conservative treatment in the individual case. There must be favorable assurance that before the nephrectomy is done, the remaining kidney will support life. On occasion, a heminephrectomy or a calycectomy may be done to remove the diseased portion of the kidney, with retention of the normal part.

An incision made downward through the strictured area and sutured across the course of the ureter at right angles to the incision has proved to be a popular plastic technique for the repair of ureteral strictures.

As a rule no definite plastic procedure can be planned until the kidney or ureter has been exposed and the exact nature of the obstruction determined. Two principles must be kept in mind: to construct free drainage to the kidney that will permit no accumulation of urine, and to provide adequate drainage for the parts during the convalescent period.

A nephrostomy may have to suffice on occasion when it is imperative to establish immediate drainage of an infected kidney with the minimum of surgical shock. A dilated ureter is a good site for drainage in hydroureter or hydronephrosis. The conventional T-tube is a very satisfactory drainage tube in this location.

Diversion of the urinary stream by means of ureterointestinal anastomosis or ureterocutaneous transplant, with or without cystectomy, is an established procedure in children as well as in adults.

The drugs most commonly used at the present time as urinary antiseptics are the various sulfonamide derivatives, penicillin, streptomycin, mandelic acid, methenamine, and the various alkalinizing agents. The preoperative use of chemotherapy is advisable and should be continued during the postoperative period as long as fever or pyuria persist.

Too much benefit should not be expected of any antibacterial agent as long as a mechanical problem of stagnation or stasis exists. The most potent aid that can be given drug therapy is the restoration of a normal current of urine through the urinary passages.

The article is well illustrated with pyelograms of many interesting pediatric urological cases.

CONRAD A. KUEHN, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Anatomoclinical Study of 2 Cases of Primary Tuberculosis of Striated Muscles (Considerazioni anatomocliniche su due casi di tubercolosi primaria dei muscoli striati). RENZO CORTESI and GIORGIO VENTURI. *Arch. ital. chir.*, 1948, 70: 216.

As a rule, tuberculosis of the muscles is secondary to a specific process in other organs. A primary lesion of the muscles is very rare. Tubercle bacilli may reach a muscle either through the blood stream or by contiguity. Tuberculosis of hematogenous aspect may assume one of two forms: (1) miliary, in the form of grayish nodules which may show a tendency to confluence and caseinization, or (2) circumscribed, with casein formation in the center and a large fibrotic peripheral zone. Fungus or abscess formation with complete liquefaction of the center may result.

The involvement of a muscle by contiguity is observed more frequently and may follow pleurisy, osteoarticular lesions, or lesions of the lymph nodes.

The authors apply the term "primary tuberculosis" to a lesion which is of hematogenous origin. He refers to reports in the literature of 92 cases of primary tuberculosis, and reports 2 cases of his own.

A cystic tumor was removed from the left pectoralis muscle in a woman 48 years of age. The Ziehl stain of the specimen failed to reveal tubercle bacilli, but the presence of Langhans' cells and other typical findings established the diagnosis.

There was no history, and no evidence, of a specific lesion in any other organ. The skin reaction after the operation was positive.

A man 22 years of age, with a previous history of a right exudative pleurisy, developed a swelling over the right latissimus dorsi muscle, which was diagnosed as either a sebaceous cyst or a granuloma of unknown origin. Although no tubercle bacilli could be detected in the specimen, the presence of giant cells and other typical findings established the diagnosis of tuberculosis.

The general condition of both patients was good.

The preoperative diagnosis of such lesions is very difficult unless changes in other organs can be detected. In the differential diagnosis, one should consider various neoplasms, tumefactions of parasitic origin, and specific inflammations caused by syphilis, lepra, actinomycosis, sporotrichosis, anthrax.

Three types of tuberculosis of the muscles may be distinguished: (1) nodular, (2) sclerofungous, and (3) abscess.

Early and radical surgery is indicated and should be followed by postoperative x-ray therapy. Medical, dietetic, and hygienic measures should supplement local treatment. JOSEPH K. NARAT, M.D.

Cavernous Angioma of Striated Muscle (Sull'angioma cavernoso dei muscoli striati). PIERO FORCONI and ALESSANDRO FICAI. *Gior. ital. chir.*, 1948, 4: 347.

The authors describe a case of angioma of the flexor muscles of the forearm and analyze the clinical characteristics and the histopathology of the classification. They believe that the case they describe must be considered as an angioblastoma according to the classification proposed by Costa. This tumor has no relationship to trauma, and the inflammatory processes must be considered as congenital on the basis of a disturbed mesenchymatous tissue, proposed, in a sense, by Albrecht.

The authors give a detailed report of an adult male, age 20, whose personal history was essentially negative. For a period of 5 years the patient had noticed a double tumefaction of the middle third of the right forearm. The tumor was about the size of a walnut and produced no incapacity of the arm. Some pain was produced by pronation of the forearm and flexion of the fingers. The mass was surgically removed without difficulty and healing was by primary intention. Sections of the tumor mass are shown in the article.

The authors have collected over 300 cases of angiomas from the literature and have presented a résumé of the subject. CARLO SCUDERI, M.D.

Calcifying Tendinitis of the Shoulder. NEWTON C. MEAD. Q. *Bull. Northwest. Univ. M. School*, 1948, 22: 270.

Calcifying tendinitis is the commonest cause of pain and disability of the shoulder. Although frequently called "bursitis," the calcium occurs and remains in the substance of the tendon until it points and ruptures. The bursal floor becomes inflamed as a result of this but this bursitis does not resemble the process so commonly met with in other bursae of the body in which the bursa, following overuse or direct injury, becomes tender, painful, and distended with fluid. A similar calcifying process occurs in tendons and ligaments elsewhere in the body, as in Pellegrini-Stieda's disease, in which no bursa is present.

The etiology is uncertain. It is commonly stated that it is a degenerative condition resulting from trauma of the tendon. There is no reason to doubt this, but it is interesting to note that only 12 of 180 patients studied gave a clear-cut history of a traumatic origin of the condition. No relation of the disease to the occupation of the patient could be found. Overhead workers, such as painters and plasterers, do not appear to be frequent sufferers. In the male, the distribution between the right and left shoulders in this series is exactly even. Surprisingly, in the female patients there is a marked

preference for the right shoulder over the left, a ratio of 67 to 31. No explanation for this is apparent.

The best available information of the pathology of this condition is given by Codman. He found degenerative areas in many shoulder tendons which appeared to be due to traumatic rupture of a few of the internal fibers. He also found ovoid bodies similar to rice bodies occupying the defect in the tendon and believed them to be the precursors of the calcified mass. What occurs to cause the calcification and inflammation is not known, but at times there is a definite relationship to additional trauma. The truly disabling, severe symptoms do not occur until the calcified mass has expanded and is protruding under the serosal floor of the bursa. It thus produces a bursitis of a definite inflammatory nature. However, the bursa rarely becomes distended with fluid. Codman pointed out that if the subdeltoid bursa is distended, it is very good evidence that there is a rupture of the musculotendinous bursal floor and a communication with the shoulder joint proper. The calcium itself is not chemically irritating, as is proved by the relative absence of pain in patients in whom the bursal sac is full of a calcified suspension. The excruciating pain is directly related to the tension within the calcified deposit while it is still imbedded in the tendon.

The author divides his cases into four types.

1. Acute calcifying tendinitis (63 cases). In this condition the onset is sudden and the slightest motion of the shoulder is agonizing. The patient is completely disabled. The acute symptoms last from 3 to 7 days without treatment. There is gradual recovery, without disability, in several weeks or months. Roentgenograms taken during the height of the symptoms will show a mass of imbedded calcium in the fibers of one of the tendons of the musculotendinous cuff which makes up the floor of the subacromial bursa. After the severe pain has subsided, calcium is seen in a much less dense form in the dependent portion of the bursa itself, but the calcium in the tendon will not have changed greatly in appearance. Roentgenograms a month later will, in favorable cases, show complete disappearance of the calcium from the area.

2. Chronic calcifying tendinitis with acute exacerbation (43 cases). If untreated, the acute attack will end spontaneously after a few days or weeks, but the calcium will not disappear from the tendon, and the symptoms of chronic tendinitis persist.

3. Subacute calcifying tendinitis (17 cases). The onset is gradual and there is never the intensity of pain seen in the acute type; the condition does not subside spontaneously except after very long periods.

4. Chronic calcifying tendinitis (37 cases). The calcium seen in the roentgenogram has a hard, dense appearance and may vary from a small speck to a very large mass. The shoulder will not rotate easily, and abduction is limited, usually with pain as the greater tuberosity passes beneath the acromion.

Surgical decompression, either by needling or open incision of the mass, is a logical and very effective method of treating patients with acute cases, and an acute flare-up in chronic cases. It is not indicated in chronic cases as the deposit is not under tension. In these cases symptoms result from the tendinitis itself and the bursitis associated with it. The pain is at its worst when the degenerated tendon is under tension or when its insertion is brought into contact with the acromion, as in abducting the arm; in the latter case the tip of the acromion may be removed. The technique of needling and surgical decompression is described in detail.

JOHN J. CRANLEY, JR., M.D.

Subcutaneous Rupture of the Extensor Pollicis Longus Tendon (Rottura sottocutanea del tendine del lungo estensore del pollice). LIBERO UGELLI. *Policlinico*, sez. prat. 1948, 55: 550.

The author reports a case of subcutaneous rupture of the extensor pollicis longus tendon that was diagnosed one month after an injury to the thumb without any fracture or breaking of the skin.

The patient was operated upon and repair was accomplished by suture of the distal portion of the extensor pollicis longus tendon to the extensor pollicis brevis tendon. The result was excellent.

The author reviews the literature and proposes a classification based on the mechanism of the rupture.

The first case was reported in 1876 by Duplay. Eighty-five cases were reported in the literature up until 1932. CARLO SCUDERI, M.D.

Anatomical Studies on Lumbar Disc Degeneration. STEN FRIBERG. *Acta orthop. scand.*, 1948, 17: 224.

One hundred lumbar vertebrae, together with the sacra, were removed as soon as possible after death, and permitted the study of 500 intervertebral discs and 1,000 intervertebral joints. The sacrum was fixed in a vice and the specimens were flexed and extended without force, and so roentgenographed. After a short period of formalin fixation, the discs were cut horizontally and macrophotographed. The intervertebral joints were removed separately and decalcified. These investigations have not yet been concluded, and an effort will be made to study the relation between disc and joint changes.

Histological examination of disc material shows that regressive changes in the nucleus occur early These are interpreted as signs of a normal age involution rather than pathologic degeneration. As the age increases, the amount of fluid in the nucleus decreases, fibrosis increases, and the borderline between the disc and the annulus becomes less distinct. This occurs without clinical signs or degenerative symptoms. When fissure formation is found in the annulus, degeneration has occurred.

Anatomical investigation of the degeneration shows variations according to the disc level in the lumbar spine. In the upper lumbar region the disc degeneration showed a concentric arrangement, and fissure formation was observed all around the disc. In the two lower discs the degeneration was situated mainly in the lower portion. A sagittal path ex-

tended from the nucleus dorsally to the posterior longitudinal ligament, running out on both sides in the form of a T, and often extending to a point slightly lateral to the intervertebral foramen. Schmorl-Junghanns, Guentz, and others have pointed out that in the thoracic region the anterior portion of the disc is affected owing to the greater anterior pressure after the disappearance of the nucleus. The author believes that the lumbar lordosis contributes to the specific type of lower lumbar disc degeneration.

Disc degeneration was found in the backs of 32 patients and disc prolapse was found in 11. In those with prolapsed disc, extensive degenerative changes also were present. It was found that in all cases in which a disc showed roentgenological instability without other roentgenographic indication of disc degeneration (reduction in the height of the disc, osteophytes, and sclerosis) fairly widespread fissure formation was nevertheless present in the annulus, especially posteriorly.

Disc prolapse is the result of previous disc degeneration, the trauma playing the part of the liberating factor. A negative roentgenogram does not preclude the existence of fairly advanced changes in the disc.

The author favors lumbosacral fusion early, as soon as instability is diagnosed. His studies have shown that in cases in which extensive laminectomies have been performed previously, lumbosacral fusion has given unsatisfactory results.

DANIEL H. LEVINTHAL, M.D.

Eighteen Observations of Bilateral White Tumors of the Knee (A propos de dix-huit observations de tumeur blanche bilatérale du genou). P. INGELRANS, A. VENDEUVRE, and NIGOUL. *Lille chir.*, 1948, 15: 115.

During a period of 28 years the authors have observed 691 unilateral and 18 bilateral tuberculous tumors of the knees. In other words, the bilateral lesions occurred in 2.53 per cent of the patients—7 males and 11 females—and the youngest patient was 2 years of age. Six patients were younger than 10 years, the ages of 7 patients ranged from 10 to 21 years, the ages of 3 ranged from 21 to 25 years, 1 patient was 34 years, and 1 was 54 years of age.

In 7 cases other osteoarticular lesions were present, in 3 the pleura and the lungs were involved, and in 2, specific visceral conditions were discovered.

As a rule, one side was affected to a higher degree than the other. Not infrequently the patient suffers osteoarthritis on one side, and synovitis in the opposite knee, and during treatment of the osteoarthritis, a clinical recovery of the synovitis is effected and the patient resumes his activity, but after awhile a recurrence of the synovitis takes place. The remission may last a few years in children, but is usually shorter in adults.

Inasmuch as roentgenographic examination frequently fails to give sufficient information and the symptomatology of synovitis may be very scanty, other diagnostic methods are necessary. The use of various culture media and even inoculation may give negative results. Successive passages through a few guinea pigs may be necessary to reveal the presence of tubercle bacilli. Biopsy of the synovia is of great diagnostic value.

The establishment of the correct diagnosis is essential because positive findings suggest a resection. This is a grave decision because a bilateral ankylosis of the knees results from the operation.

The authors have discontinued treatment by synovectomy because it produced unsatisfactory results.

In spite of a bilateral ankylosis of the knees, sometimes accompanied by an ankylosis of the hips, the functional results may be more or less satisfactory. The authors were able to obtain 8 cures, while 1 patient succumbed to pulmonary complications.

JOSEPH K. NARAT, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Resection of the Lower Extremity of the Ulna (La resección de la extremidad inferior del cúbito). HEBERT CAGNOLI and JORGE GARCIA NOVALES. *An. ortop. traumat.*, 1948, 1: 69.

Although mutilating from the anatomic point of view, from the functional viewpoint resection of the lower extremity of the ulna offers chances of restoration or preservation of the movements of pronation and supination.

The operation should be considered when one of the following conditions is present:

1. Recent fracture: (a) fracture of the lower end of the radius with dislocation of the ulna; (b) fracture of the lower end of the ulna, irreducible by closed methods, with lower radioulnar dislocation; and (c) comminuted fracture of the lower ulnar epiphysis.
2. Old fracture and its sequelae: (a) metaphysodiaphyseal or diaphyseal fracture of the radius with dorsal or radial angulation causing a palmar or dorsal subluxation of the ulnar epiphysis; (b) fracture of the lower end of the radius with angulation; (c) fracture of the lower end of the radius with shortening of the bones, responsible for a dislocation of the lower radioulnar articulation; (d) fracture of the lower extremity of the radius, well reduced from the anatomic point of view but distorting the lower radioulnar articulation; and (e) sequelae of a fracture of the lower ulnar epiphysis.
3. Sequelae of a fracture of the lower extremity of the radius causing functional disturbances such as pain and limitation of supination.
4. Traumatic dislocation of lower end of ulna.
5. Tumors of the lower end of the radius or ulna.
6. Arthrosis or ankylosis of the lower radioulnar articulation.
7. Madelung's congenital deformity.
8. Sequelae of acute, subacute, or chronic arthrosis of the radiocarpal articulation, if arthrodesis is indicated.

9. Arthrosis of the radiocarpal articulation of traumatic origin, usually following the pseudarthrosis of the navicular bone, if surgical arthrodesis is indicated.

The authors illustrate the value of the method with reports of 21 cases.

The bone is resected with a Gigli saw through a longitudinal incision over the lower end of the ulna.

JOSEPH K. NARAT, M.D.

Osteotomy of the Vertebral Column; Smith-Petersen Operation (Osteotomia de la columna). AMERICO NUNZIATA. *Prensa med. argent.*, 1948, 35: 1536.

The author describes an operation for the correction of the simian type of posture created by the various types of spondylitis, especially the rheumatic form.

In a staged procedure, the author removes the intravertebral fibrocartilaginous disc between the second and third lumbar vertebrae after forceful maneuvering of the vertebral column into an upright position, as shown in Figure 1. The results obtained have been gratifying.

A lateral approach, and the use of an iliac graft, including both hip joints in a corset, permits early ambulation with the assurance that there will be no recurrence of the flexion. It is believed that these steps have greatly simplified the operation for curvature of the spine.

STEPHEN A. ZIEMAN, M.D.

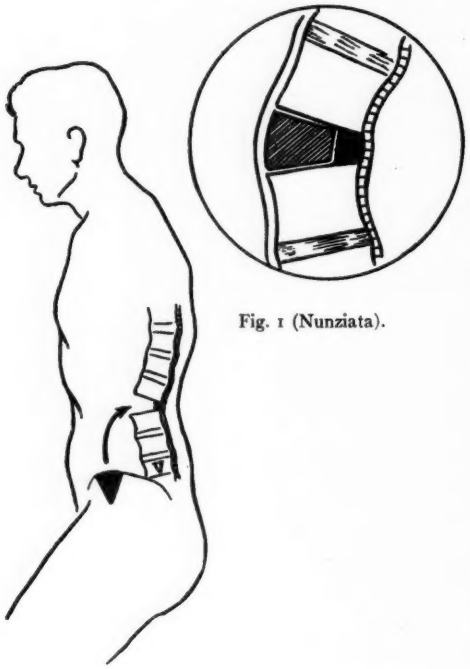


Fig. 1 (Nunziata).

A Procedure of Foot Disarticulation with Partial Conservation of the Calcaneus (Sur un procédé de disarticulation du pied avec conservation partielle du calcanéum). A. RICARD. *Lyon chir.*, 1948, 43: 299.

The author discusses the disadvantages of the different classical methods of foot amputation (Chopart, Symes, Pirogoff, and others). He devised a modification of the Symes operation in which a part of the calcaneus is saved and mortised between the malleoli, with or without resection of the Achilles tendon. With this procedure, the drawbacks of the Symes operation, undue shortening of the leg, and weight bearing by the leg bones are avoided. At the same time it provides ample skin covering for the stump.

WERNER M. SOLMITZ, M.D.

FRACTURES AND DISLOCATIONS

Treatment of Simultaneous Fractures of the Two Bones of the Forearm, Particularly in Children (Traitement des fractures simultanées des deux os de l'avant-bras, en particulier chez l'enfant). MARCEL FÈVRE. *Rev. orthop.*, Par., 1948, 34: 243.

Fractures of the diaphyses of the radius and ulna in children are usually less serious than those in adults. However, this fact is no excuse for any neglect because all of the complications are encountered at all ages and many poor results are not helped by growth and some even become worse.

In addition to the correction of deformities and the maintenance of good reduction, it is necessary to avoid pseudarthrosis and exuberant callus in fractures of the forearm. The correction of deformities includes correction in length, which necessitates clinical and roentgen examination not only of the two bones but also of their articular extremities, preservation of the pronator curve of the radius and of the width of the interosseous space, and correction of displacement. The maintenance of the fragments in good position requires supervision by successive roentgen examinations because secondary displacements are particularly frequent in the forearm. Pseudarthrosis can be prevented by immobilization for a period of at least 6 weeks which must sometimes be increased, especially after surgical intervention. To prevent the formation of excess callus and synostosis, all causes of osteoperiosteal irritation must be eliminated; massage must therefore be rejected and long continued immobilization assured.

Greenstick fractures, which have been neglected because of their supposed benignancy, are sources of disappointment if they are not perfectly reduced with complete fracture of the cortex and immobilization for an average of 6 weeks.

Most fractures in children respond to proper orthopedic treatment. Irreducible and some intractable fractures require surgical treatment. Simple replacement of the fragments is often enough. Among the classical methods of fixation, the author prefers central pegging, preferably with fresh bone, and Ombrédanne's external synthesis with screws and

connecting plate. This requires only one operation and the apparatus adapt themselves well to the phenomena of growth. If only one bone is fixed, it is best to choose the radius as its shortening is much more serious than that of the ulna; if necessary, the ulna is fixed after the radius.

The insertion of a stainless steel pin into the medullary canal instead of Kuntscher's nail tends to replace the old methods of synthesis in children. Its ease of introduction into the ulna makes this the operation of choice for this bone. The operation is somewhat more complex for the radius. The pins must respect the epiphyseal cartilages. It is logical to begin with the bone which is easiest to handle, (the ulna); the radius is then often reduced spontaneously; if not, it is also fixed. Fluoroscopy should be available in the operating room to control the reduction. The method should not be regarded as a panacea that can be used without all the precautions required by bony synthesis. RICHARD KEMEL, M.D.

Dislocation and Fracture Dislocation of the Pelvis. F. W. HOLDSWORTH. *J. Bone Surg.*, 1948, 30-B: 461.

The author's article is based on a study of 50 cases of fracture of the pelvic ring. Two types of fracture are listed: (1) dislocation of the sacroiliac joint, and (2) fracture of the ilium or sacrum adjacent to the sacroiliac joint. In both types there is separation of the symphysis pubis, or fracture of both pubic rami. In both, there is outward displacement of one-half of the pelvis.

Forty-two patients survived and were followed up (27 with dislocation of the sacroiliac joint, and 15 with fracture of the ilium or sacrum near the joint).

Visceral complications and injury to the bladder and urethra were rare in this series, there being only 4 cases of injury to the bladder and urethra. Two patients had large extraperitoneal tears in the bladder, and both died. Retroperitoneal hemorrhage was a more frequent complication, and was the cause of death in 4 cases. Fractures of the pelvis were treated by suspending the patient in a canvas sling. Both lower extremities are placed in Buck's extension with slight flexion at the hips. Manipulation may be necessary if there is a rotation displacement. Fixation is maintained for 12 weeks.

The average period of follow-up is 5 years, and no case is followed for less than 2 years. About one-half of the patients with sacroiliac dislocation were able to return to reasonably heavy work, and practically all of the patients with fracture were able to do so. The frequency of persistent sacroiliac pain after dislocation suggests that early sacroiliac fusions should be suspected.

RICHARD J. BENNETT, JR., M.D.

Pathologic Dislocation of the Hip Joint. A. F. BRYSON. *J. Bone Surg.*, 1948, 30-B: 449.

The author reports 17 cases of pathologic dislocation of the hip—a short leg and a limp—observed at varying ages of childhood and adolescence. Fourteen of these patients have been traced and re-examined.

Among these 17 cases reconstruction of the Colonna type was performed in 1 case, subtrochanteric osteotomy was done in 4 cases, and arthrodesis of the hip in 11 cases; 1 patient was not treated surgically.

The patients were followed for a period of 10 years after operation. Subtrochanteric osteotomy was done in 4 cases, with success in only 1 case. In the cases in which subtrochanteric osteotomy was performed as a secondary operation, the results were excellent. In 1 case, arthroplasty was attempted at the age of 8 years, with failure. The best results were obtained with arthrodesis of the joint which gave a stable, strong, and painless hip. Among 11 patients so treated, good bone fusion was secured in 7. Union occurred in all 4 patients who were operated upon after the age of 12 years, while only 3 of 7 patients operated on before the age of 9 years obtained satisfactory fusion.

The author believes that arthrodesis should be delayed in cases of this type until the age of 12 or 13 years. Only 1 patient in the present series complained of pain in the back after arthrodesis. Shortening is combated by bringing the trochanter down as nearly as possible to its normal level.

RICHARD J. BENNETT, JR., M.D.

Ununited Fractures of the Neck of the Femur. JAMES A. DICKSON. *J. Am. M. Ass.*, 1948, 137: 1199.

In spite of the increased number of united fractures which internal fixation has yielded, from 35 to 50 per cent of intracapsular fractures of the femur are functionally unsuccessful.

The present article is devoted to a study of ununited fractures. From the findings in this study, it seems possible to restore anatomic and physiologic function to the hip joint. Once nonunion is recognized, the earlier the operation is performed, the better will be the results. An understanding of the basic principles of causation makes earlier recognition and rational repair possible.

The mechanical factors of the angle of the fracture, and of circulation are most important. Fracture lines which tend towards the vertical not only inhibit union by shearing action, but facilitate aseptic necrosis by depriving the femoral head of contact with the medullary circulation.

The aim of treatment then must be to secure impaction at the fracture line and to re-establish circulation to stimulate osseous repair.

The numerous techniques involving one or the other of these principles are critically reviewed, and failure of operation occurred in from 35 to 50 per cent of all the cases in this category. The author presents his technique of a controlled high osteotomy which changes the inclination of the fracture line from about 65 degrees to less than 30 degrees; a bone graft from the ilium is added, to aid in revascularization and osteogenesis. The procedure has yielded solid union with equalization of leg length in 9 out of 10 patients operated upon.

Conservatism is urged in handling the "dead" femoral head, since such heads may become re-

vascularized and functional if weight-bearing is prohibited while regeneration is taking place. Perhaps a more careful selection of the primary procedure in these fractures might reduce the incidence of nonunion, and surely the earliest possible surgery must be undertaken when nonunion is known to exist, as waiting permits degenerative changes which militate against a favorable outcome.

FRANCES E. BRENNECKE, M.D.

Trochanteric Fracture. MATHER CLEVELAND, D. M. BOSWORTH, and F. R. THOMPSON. *J. Am. M. Ass.*, 1948, 137: 1186.

The concept that the trochanteric fracture is a simple one to handle and always will give a good result is erroneous, and disregards the frequent sequelae of disability and discomfort which often plague patients with this condition for life. A study of 133 consecutive cases observed at St. Luke's Hospital, New York, shows that the lesion is not simple and does not routinely come to a good result.

The average age of the patients is more than 75 years, and 90 per cent of them are women. Commonly, they have numerous physical, mental, or both types of changes in addition to the fracture, so that they are not "good risks" for any care.

The injury initiating these fractures is usually slight, the result of stumbling or a slight fall, but often dissolution of the bony structures prior to the injury is really the cause of fracture. The response to rapid and definitive treatment for relief of pain and spasm is good if procedures are carried out rapidly and the patient is well supported.

The choice of treatment depends on the ability and experience of the medical personnel, as well as on the type of trochanteric fracture. However, the various levels at which fracture occurs influence the treatment less than they do the end result and the length of time required to secure union. Modes of conservative treatment are reviewed, and of them, Russell's balanced traction is recommended over any other than internal fixation when that can be competently carried out.

A survey of 133 consecutive cases, with 94 per cent follow-up, was conducted. A group of 38 patients treated by balanced traction was compared with a group of 95 patients treated by internal fixation. The numerous complications arising in spite of excellent hospital care of the "traction" patients led to the trial of internal fixation with a Jewett type of nail made of vitallium. With nails of assorted angles and lengths at hand, and a speedy surgical and roentgen team for accurate, rapid work, the results were good.

Postoperatively, light traction is maintained temporarily, followed by a Thomas brace with pelvic band and knee lock. Crutch ambulation with minimal weight bearing is permitted early, but the brace must be worn until union is solid. This takes from 3 to 7 months.

Complications occurred, but less frequently than in the traction-treated group. The most annoying complication was gradual progression of the nail through the femoral head and into the acetabulum. Too long a nail and early or too active weight bearing predispose to this complication. The symptoms are minimal, and removal of the nail has been done readily and without further complications.

Conservative care netted a hospital mortality of 36 per cent, while in the operative group of patients it was 12.6 per cent. Senile psychosis occurred in 11 per cent of the "traction" patients and in only 2.1 per cent of those subjected to nailing.

The survival rate of these patients is not high in any case, but 1 year after fracture, 32 per cent of the group treated by traction and 72 per cent of those subjected to nailing were alive. After 4 years, the survivals were 13 per cent and 30 per cent, respectively. Now all intertrochanteric fractures are nailed according to this technique.

FRANCES E. BRENNECKE, M.D.

Treatment of Pertrochanteric Fractures (Zur behandlung der pertrochanteren fracturen). H. BRÜTSCH and W. J. PIROŽYŇSKI. *Helvet. chir. acta*, 1948, 15: 209.

The present treatment of pertrochanteric fractures by extension for several months or by the application of a plaster cast is a difficult experience for the patient, who is usually old; it also entails much tiresome care. Therefore, the authors have used internal fixation of the fracture by passing several Kirschner pins through the skin and the fragments in the following manner.

After preparation of the skin the patient is placed on the orthopedic table and the fracture is carefully reduced; special attention is given to the correction of external rotation. The soft tissues lateral and caudal to the trochanter are anesthetized. To determine the direction of the pins during their insertion, a wire screen (anteroposterior direction), a water level, and a protractor (axial direction) are used. After the first two or three pins have been inserted, roentgen films are taken in the anteroposterior and axial directions. If one of the pins is in the correct position, the direction and depth of penetration of the others are patterned accordingly. Further control films are taken and the necessary corrections made after each insertion of three pins. Good position of the pins in the axial direction is usually the greatest problem. An effort is made to place the pins so that their whole course lies inside the femoral neck. Any pin that pierces the articular cartilage is pulled back to a subchondral position. The arrangement of the pins and their number depend on the fracture and especially on the size of the lateral spur of the shaft fragment. Usually, from 6 to 8 (rarely, 10) pins are used. In intertrochanteric fractures, or in cases in which the fracture line runs, without strongly lateral convexity, from the tip of the great trochanter to the lesser trochanter, the pins are inserted convergently up to the femoral head. The shorter the spur the more caudal the insertion of the pins on the femoral shaft and the steeper their

course. The pins are often allowed to cross one another. The portion of the pin which protrudes through the skin is cut off as deeply as possible while an assistant depresses the soft tissues with two flat instruments. A dry dressing is applied and the leg is kept between sandbags for 14 days, when slight active movements may be started.

This method was used in 23 cases during the last 2 years. The majority of patients were women in bad general condition; 9 of them were between 70 and 88 years old; to avoid pulmonary and cardiovascular complications, the insertion of pins was performed, frequently on the second or third day, and even immediately after admission. Movements in bed were started after from 4.5 to 15 weeks (average, 8 weeks) and the patients were taken out of bed and began to use the extremity after from 10 to 27 weeks (average, 14 weeks). In several cases the pins were removed before the extremity was used (average, 13 weeks) because they were about to pierce the skin. Healing occurred in all cases despite severe senile osteoporosis in many of the patients. Loosening of pins occurs rarely, and never to such a degree that the roentgen picture shows clearing around the pin. One case was observed in which the faulty insertion of the pins led to heat damage of the bone, thus demonstrating the danger of the use of drills and circular saws in bone surgery. RICHARD KEMEL, M.D.

Aseptic Necrosis of the Femoral Head. CARL E. BADGLEY and R. H. DENHAM. *J. Am. M. Ass.*, 1948, 137: 1193.

The term "aseptic necrosis" has been too loosely used to make comparable studies of end-results so classified and various phases of degenerative arthritis. "Avascular necrosis" may be used, more specifically, to define death to part or all of the femoral head due to vascular damage primarily of the posterior and anterior circumflex femoral vessels.

Although the bone necrosis quickly follows severe vascular damage, it cannot be demonstrated (by its relative density) roentgenologically for from 2 to 3 months. Subcapital and transcervical fractures are suspects of avascular necrosis, particularly when manipulation or open surgery upon the capsule further jeopardizes the supply of blood to the femoral head.

The frequency of avascular necrosis in fractures in which internal fixation has been followed by bony union is rather high, about 40 per cent in one study. Although the internal fixation itself does not produce avascular necrosis, it does produce a high per cent of united fractures in spite of a dead femoral head.

Four main types of complications are noted in the process of repair of fractures of the femoral neck:

1. Bony union with a period of functional use followed by pain, roentgen changes in density and contour of the femoral head from collapse of the weight-bearing surface. The term "aseptic necrosis" should be restricted to this entity.

2. Bony union followed by decreasing function, pain, loss of joint space, but maintenance of the contour of the femoral head. To this state the term "degenerative arthritis" may be accurately applied.

3. Nonunion of the fracture may be associated with a dead head.

4. Nonunion of the fracture in the presence of a viable head.

Phemister's contributions to the clinical and pathologic knowledge of these complications are reviewed, and a résumé of the means of avoiding unnecessary damage to the vascular supply is offered. Of major importance is avoidance of weight-bearing until the viability of the head and union are ascertained with roentgenograms. In spite of careful treatment, avascular necrosis is a serious complication which may result in a poorly functioning hip.

Choice of operative therapy depends upon the degree of degeneration and the type of patient chiefly, and ranges from a vitallium mold arthroplasty to arthrodesis of the hip. Various reconstruction operations are useful in certain instances and in experienced hands. FRANCES E. BRENNECKE, M.D.

Surgical Treatment of Uncomplicated Knee Dislocation (Traitement chirurgical des luxations non compliquées du genou). BASTIEN and VANHILLE. *Lille chir.*, 1948, 14: 53.

In appropriate cases, early surgery in dislocations of the knee is advisable. It permits thorough evacuation of the hemarthrosis, and tears of ligaments, capsule, and muscles can be explored and repaired. The meniscus can be resected partially or completely, if necessary. Furthermore, in cases in which reduction is impossible because of interposition of parts of the capsule between the articular surfaces, open reduction is imperative. Effective repair of the cruciate ligaments is, in most cases, impracticable and unnecessary. The authors suggest removal of the torn portions without suture of the cruciate ligaments. Perfect suturing of the lateral ligaments to insure the greatest stability of the joint is important. Surgery should be performed within 4 or 5 days after injury.

The approach to the different ligaments and the technique of operation are discussed in detail. For repair of the internal lateral ligament, the authors suggest a horizontal incision a little superiorly to the joint, which is continued proximally and posteriorly in a vertical direction. This approach exposes the ligament in its entirety and at the same time permits perfect exploration of the joint. The branches of the saphenous nerve are spared by this incision, and no sensory disturbances are observed postoperatively. The external lateral ligament is exposed by an oblique straight incision, beginning at the condyloid tuberosity and ending at the head of the fibula.

For exposure of the cruciate ligaments, different techniques are employed. The authors prefer the transtuberous route for the anterior ligament and part of the posterior ligament: A U-shaped incision is made, the horizontal portion of which crosses a little inferior to the tuberositas tibiae. The tuberosity is dissected, and the patella and patellar liga-

ment are turned upwards; this permits wide exposure. The inferior insertion of the posterior cruciate ligament is approached by a vertical incision in the popliteal space between the semimembranosus and gastrocnemius.

In old or neglected cases, symptoms of instability and muscular atrophy may be present. Arthropneumography may reveal lesions of the menisci and cruciate ligaments. In these old or neglected cases suturing of the ligaments is not successful, and autoplastic operations with the use of tendons must be performed. WERNER M. SOLMITZ, M.D.

ORTHOPEDICS IN GENERAL

Total and Subtotal Sacrococcygeal Agenesis (Agenesias sacrococcigeas; totalis y subtotales). JOSÉ M. JORGE and HÉCTOR JORGE. *Rev. As. med. argent.*, 1948, 62: 389.

The authors review 21 cases of total, and 27 cases of subtotal sacrococcygeal agenesis reported in the world's literature. They add one case of their own, that of total absence of the sacrococcygeal segment, the clinical history of which has been followed for a period of 20 years.

The boy was first seen at the age of 4, and at this time the condition was diagnosed as congenital absence of the lumbosacrococcygeal segment, iliac luxation of both hips, and bilateral equinovarus. There was a gibbus formation in the lumboiliac articulation to which the aponeurosis and ligaments were attached. Twelve years later the boy was able to get about dexterously on crutches, and had grown, although he was small of stature for his 16 years. His chest and arms were large and well developed, whereas his waist, hips, and legs were atrophic and of the paralytic type. There was complete incontinence of urine and, for the most part, absence of any sensation of defecation.

The patient was examined periodically from 1938 to 1947, the various changes were recorded, and the roentgen-ray views were compared.

STEPHEN A. ZIEMAN, M.D.

The Nutrition of the Articular Cartilage and the Formation of the Synovial Fluid under Various Functional Conditions. Experimental Research on Rabbits with Concurrent Observations on the Compressibility of the Articular Cartilage With and Without a Fluid Supply Approaching Physiologic Conditions (Ueber die Ernaehrung des Gelenkknorpels und die Bildung der Gelenkfluessigkeit unter verschiedenen functionellen Verhaeltnissen. Eine experimentelle Untersuchung an Kaninchen unter gleichzeitiger Beruecksichtigung der Kompressibilitaet des Gelenkknorpels bei bzw. ohne Fluessigkeitszufuhr). BO E. INGELMARK and JOSEF SÄÄF. *Acta orthop. scand.*, 1948, 17: 303.

Experiments were carried out on 40 (8 months old) rabbits. Both shoulder joints were used, the right and left shoulders being scattered throughout the various groups without reference to right and left sides and without regard to the individual animal. However, a number of these shoulders were used as controls in the various manipulations involved, so that only about 60 of these joints were employed in the true study. With the exception of one living control rabbit the work was done on killed animals. The total material was divided into 4 groups. In every case the removed shoulder joint was encased up to the cartilage in Wood's metal, and mounted in an apparatus, constructed by Ingelmark, for measuring the compressibility (changes in thickness in the cartilages). In every case the blood was washed out of the experimental field by a perfusion fluid (dextran) which was developed by A. Groevall and B. Ingelman (*Acta physiol. scand.*, 1944, 7: 97; 1945, 9: 1.), and which is used extensively in local medical practice as a substitute for blood serum. For histologic examination the tissues (cartilage, capsule, synovia, joint fluids) were mounted on smears or sections stained with iodine in a solution.

In the first group of experimental animals the arteries leading to articular regions was perfused with dextran containing a suspension of rice starch granules (about 1,000 granules per cubic centimeter). In this group the starch granules were later found distributed in the articular cartilage, about three-fourths of them in the basal third, a fourth in the middle third, and none in the upper third of the cartilage; that is, the third adjoining the joint cavity.

In the second group the starch suspension was suffused into the marrow cavities adjoining the scapular and the humeral articular cartilages. Here one-half of the granules were found distributed within the basal third, a third within the middle, and a sixth within the superficial third of the thickness of the cartilage.

In the third group the procedure was the same as in the second, except that during the injection into the marrow cavity the joint surfaces were repeatedly pressed together and as often the pressure released, attempting in this manner to imitate the vital function of the joint during the life of the animal. In these joints, about one-fourth of the starch granules were later found distributed within the basal and middle thirds, respectively, while the other half of the granules were distributed in the superficial third of the cartilaginous thickness.

In the fourth group the treatment was the same as for the third group, except that the medullary cavity was perfused with the dextran, without the starch granules, and before the start of the experiment, 0.25 c.c. of the suspension of rice starch was injected into the articular cavity through the articular capsule. Here the cartilage was later found to be devoid of starch granules, except in a few instances in which there were a few granules in the superficial layers of the cartilage.

In this last group an interesting finding was the greater number of granules per volume unit of cartilage substance in the cartilage of the glenoid cavity than in that of the humerus. This is explained by the authors on the assumption that the starch granules would find greater difficulty in penetrating that

part of the cartilaginous substance comprising the cellular tissues; in the rabbit the glenoid articular cartilage has been shown to have a lesser cellular content than that of the humerus. On the whole there were more starch granules per unit of volume in the cartilages of the third group than in the others, and this is interpreted as due to the greater perfusion of fluid through these cartilages from the functional strain put on them during the experiment.

With regard to the effect on the amount of synovial fluid as a result of experimental manipulations, no method was found to measure accurately the amounts of joint fluid present; however, the impression was that the physiological stress put on the joint resulted in an increase in the amount of joint fluid present. The fluid in the first and second groups did not contain starch granules. In the first group granules were found in the capillaries of the synovial membrane and this finding is thought to demonstrate the presence of anastomoses between these capillaries and the vessels of the medullary cavity. In the third group there were no granules in the synovial capillaries and therefore it is thought that those found in the synovial fluid passed from the medullary cavity into the cartilage and from there into the joint cavity.

In the second group the cartilage was found to increase in thickness soon after medullary perfusion was started, and this is regarded as a result of the replacement from the medullary cavity of the fluid loss sustained during the period between the killing of the animal and the starting of the perfusion. This swelling phenomenon was even more pronounced in the third group and seems to postulate an increase in the fluid circulation in the cartilage under physiologic stress. This fact, together with the tendency of the cartilage to resume its initial volume following the compression (this tendency being stronger in the joints with medullary perfusion) suggests that the conditions under which these experiments were carried out closely resemble those present during life, and that the results obtained would apply closely to those obtained in the living subject.

JOHN W. BRENNAN, M.D.

Experimental Research for Promoting Longitudinal Growth of the Lower Extremities by Irritation of the Growth Region of Femur and Tibia. G. CHAPCHAL and J. ZELDENRUST. *Acta orthop. scand.*, 1948, 17: 371.

Shortening of one of the lower extremities may occur after poliomyelitis, joint destruction in childhood, malunited fractures, congenital hypoplasia, and other affections. In the treatment of adults, there are two methods of correction—either lengthening the short extremity or shortening the longer extremity—or an elevated shoe may be prescribed for the shortened extremity. Elongation of the shortened extremity is the most logical procedure, but its application is rather limited and it is frequently attended by complications. Shortening of the normal limb presents certain technical and physiological difficulties. One of the most successful operations is that of epiphyseodesis, described by Phemister, which arrests the growth of the longer limb.

When the epiphyseal cartilage of the shorter limb is intact, it is possible to stimulate the growth. Various efforts in this direction have been described by Stanley, Paget, von Bergmann, von Lagenbeck, Helferich, Helger, Königsweiser, Riedinger, Weinlechner, Schott, Rauch, Schüller, Reschke, Ruschenberg, and others. Ollier was the first to propose a correction of genu valgum by one-sided destruction of the epiphyseal cartilage. Roentgen therapy has been used in attempts to arrest bone growth; however, the authors consider that this may be harmful.

In the authors' experiments, bone growth has been stimulated by inserting ivory pegs into the metaphyses of growing bones of animals. They state that this lengthening is minimal and is not suitable for human practice on account of its uncertainty, and because of resulting deformities. Phemister's epiphyseodesis or the Hass wire-loop growth restraint is preferable.

DANIEL H. LEVINTHAL, M.D.

Sciatica Caused by Herniation of Intervertebral Disc. Late Results of Operation in 115 Cases (Les sciatiques discales. Résultats éloignés de 115 cas opérés). DECOULX and SOULARY. *Lille chir.*, 1948, 16: 157.

The author discusses the symptomatology, diagnosis, and treatment of sciatica caused by herniation of an intervertebral disc, and reports the late success of surgery in 107 of 115 cases.

Only about 50 per cent of the patients remembered a gross injury, like heavy lifting or a fall, as the cause of their complaints. In most cases the affection starts with repeated attacks of lumbago of several days' duration, and only gradually the picture of sciatica develops in the subsequent months or years. The Lasègue sign is practically always present; other typical signs are rigidity and scoliosis of the lumbar spine, often combined with kyphosis and torsion, so-called "corkscrew rachis," muscular atrophy, hypesthesia, and diminution or absence of the Achilles reflex. Ninety per cent of all nuclear hernias are located either between the fourth and fifth lumbar vertebrae or between the fifth lumbar and the first sacral vertebrae. The following signs are used to differentiate between the two locations:

Herniation between fourth and fifth lumbar vertebrae. Normal Achilles reflex, atrophy of buttocks, thigh, and calf; hypesthesia of the anterior malleolar region, dorsum of foot, and great toe.

Herniation between fifth lumbar and first sacral vertebrae. Absence of Achilles reflex; atrophy of anteroexternal leg muscles; hypesthesia of posterior malleolar region, sole, and heel.

This differentiation is, however, rather theoretical and not too dependable.

The roentgenogram reveals characteristic pictures only in a minority of cases (38 cases in the authors' series of 115). Injection of a contrast substance in the spinal canal should be considered only in excep-

tional and atypical cases when all other diagnostic methods have failed. Severe headaches, aggravation of pain, fever, and even more serious accidents have been reported after such myelography. If it is unavoidable to inject a contrast substance, some material which is more fluid than lipiodol should be injected and aspirated after roentgenography.

Surgery is indicated only in severe and refractory cases after medical treatment has failed. The medical treatment consists in complete bed rest for 1 month, and radiotherapy.

The operation can be performed either by laminectomy or by the lateral approach. The former method gives ample exposure but is not without danger and has been abandoned by the authors after severe complications in 2 cases—in 1 case a local postoperative pachymeningitis, in the other a paraplegia which, a second intervention showed, was caused by a hematoma pressing on the medulla. The lateral approach (extraction of the herniated disc after resection of the ligamentum flavum) does not require opening of the meningeal sac and is technically not difficult. The operation does not take more than 15 to 45 minutes. In most cases one finds the sensory root stretched over the disc like a violin string. In other cases the disc protrudes without being herniated and has to be extracted with forceps. In still other cases, nothing abnormal can be found. In these cases either the herniation cannot be visualized, or the complaints have been caused by vertebral periarthritis or by hypertrophy of the ligamentum flavum rather than by a slipped disc. Here the surgeon can either resect the sensory root or, as the author prefers, liberate the root over a large area.

The superiority of the lateral method of approach is well illustrated. Laminectomy resulted in complete cure in 69 per cent of the patients as compared with 92 per cent complete cure with use of the lateral approach. Furthermore, with laminectomy the herniation could be visualized in only 39 per cent of the patients, while in the lateral approach, herniation could be visualized in 84 per cent.

WERNER M. SOLMITZ, M.D.

The Bone Marrow on Sternal Aspiration in Multiple Myeloma. EDWIN D. BAYRD. *Blood*, 1948, 3: 987.

This study of the bone marrow on sternal aspiration in multiple myeloma is concerned primarily with three main points: (1) the type of cell or cells involved in the production of the disease; (2) the origin of this cell or these cells, and (3) cytologic criteria for the degree of malignancy.

The author gives a broad summary of the literature in regard to the first two headings, but finds very little on the third.

He has analyzed the sternal marrow biopsies in 71 cases at the Mayo Clinic. Differential counts and morphologic detail were studied completely in 51 cases, and 43 cases had been under observation long enough to attempt correlation between the abnormal cellular structure and the degree of malignancy which was present.

All 71 cases were classified as falling into the plasma cell type of multiple myeloma. In the series he can trace all gradients from the normal plasma cell to the most anaplastic and immature "myeloma" cell. He believes the common origin of the cells is in the reticulum.

The study tends to substantiate the theory that the more abnormal the diseased cells, the greater the degree of malignancy.

KENATH H. SPONSEL, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Contribution to the Biochemical Study of the Phlebitides and Their Surgical Treatment (Contribution à l'étude biochimique des phlébites et, à leur traitement chirurgical). RENÉ FONTAINE. PAUL MANDEL, and GEORGES APPRILL. *J. internat. chir.*, Brux., 1948, 8: 778.

To prevent or abort a phlebitis it is not sufficient to lower the prothrombin level by dicoumarin or to prolong the coagulation time by heparin, since, despite the use of these anticoagulants, venous complications occur or continue their course. In these cases the authors have always found Lenggenhager's time (reaction of the thrombin level) shortened, revealing a hypercoagulability which persists despite a prothrombinemia that has been greatly lowered by dicoumarin. Everything proceeds as if there were an excess of thromboplastin. Therefore, the authors think that there are phlebitides with hyperthrombinemia, and others with hyperthromboplastinemia. As a result, the biochemical control of the phlebitides should not be limited to investigations of Quick's time, of the prothrombin level, or of the coagulation time, but these examinations should be completed by the systematic study of the platelet level and Lenggenhager's reaction.

The therapeutic failures of the anticoagulants demonstrate that surgical treatment has a place in the therapy of the phlebitides. Embolic phlebitis should be operated upon to stop emboli.

The authors have operated upon 3 patients who had one or several previous small emboli; through a small femoral or iliac phlebotomy they were able to remove long, floating, and only slightly adhering clots, and thus to re-establish blood flow in the veins. Cure was complete without sequelae, 18 months later.

In adherent thrombophlebitis of the phlegmasia alba dolens type, the danger of embolism is not as great as that of late sequelae. Operation reveals clots which adhere rapidly and intimately to the venous wall. In 3 (of 5) patients operated upon, thrombectomy was performed, but was incomplete in 1 case and the course of the phlebitis was unchanged; in the other 2 cases the veins were completely freed from clots and the edema regressed rapidly; these 2 patients died later, and at autopsy the veins were found to be without new thrombosis.

Two other patients were phlebectomized; one of these died of shock and the other was cured.

Eight patients were operated upon for old phlebitis which had been present for periods of from 6 months to several years. In 3 of these, the veins were freed and periarterial sympathectomy was performed, but the results were unsatisfactory. Of the other 5 patients, complete phlebectomy gave excellent results in 3; and incomplete phlebectomy (in 2) gave slight improvement in 1 patient and resulted in failure in the other.

Iliofemoral phlebectomy was done for effort phlebitis with arterial spasm in 1 case and femoral phlebectomy was done for suppurative phlebitis in another, with excellent results.

Simple ligation, and especially of the inferior vena cava, is indicated only in embolic phlebitis; this is an emergency operation having no other object than that of preventing embolism. Thrombectomy is better since it eliminates the sequela of phlebitis; it is the method of choice for all varieties of phlebitis and gives the best late results. If it cannot be done, phlebectomy of the entire thrombosed segment should be performed. RICHARD KEMEL, M.D.

Surgery of Arterial Injuries and the Problem of Vein Transplantation (Ueber die Chirurgie der Arterienverletzungen und die Frage des Venentransplantats). KARL BAETZNER. *Chirurg*, 1947, 17–18: 345.

The author reports experiences in surgery in about 300 cases of arterial aneurysm, most of them due to gun shot injuries. The cases were observed in the surgical department of the University at Freiburg, Germany.

He emphasizes the dangers of ligation of large arteries, especially the carotid and the popliteal. Ligation of the popliteal artery leads to gangrene in from 30 to 80 per cent of the cases, according to different statistics. Also, ligation of the anterior tibial artery may lead to gangrene of the foot, even when the posterior tibial artery is in good condition. Ligation of the common carotid artery causes cere bral disturbances, hemiplegia, or death in from 20 to 50 per cent of the cases.

Therefore, in two-thirds of his cases, the author preferred reconstructive methods to ligation. End-to-end suture after extirpation of the aneurysm is possible only in smaller injuries. Often the adjacent parts of the arterial wall, proximal as well as distal to the aneurysm, are damaged for a length of several centimeters so that sutures do not hold and direct suturing is impracticable. On the other hand, if larger portions of the artery are resected and the stumps joined under tension, the diameter of the vessel decreases considerably, and insufficient peripheral circulation ensues.

In about one-half of the cases, transplantation of a vein was done successfully. It could be shown by arteriography that in a high percentage of the cases the grafts remained patent. In 1 case it was possible to examine the graft histologically 22 years after the transplantation. The wall of the grafted vein had changed to an arterylike wall and even showed typical arteriosclerosis.

Usually, the long saphenous vein is used for transplantation. However, frequently the lumen of

this vein is not wide enough, especially for grafts in large arteries like the subclavian, common carotid, external iliac, and femoral. In these cases, it is preferable to use the femoral vein. As the collateral circulation is very well developed in the venous system, even portions of from 15 to 20 cm. in length can be taken without danger of circulatory disturbance. In arteriovenous aneurysms veins from the surrounding region can be taken in some cases. However, often in aneurysms of the subclavian and carotid arteries the veins are very thin and friable so that they are not fit for grafting.

WERNER M. SOLMITZ, M.D.

Resection of the Femoral Artery in Circulatory Disturbances of the Leg (Die Resektion der Arteria femoralis bei Durchblutungsstoerungen am Bein). FR. BERNHARD. *Chirurg*, 1948, 19: 193.

The author believes that in circulatory disturbances of the leg, especially in thrombosis and aneurysm of the femoral artery, resection of the artery is the method of choice. In contradistinction to other large arteries of the body, the femoral artery often becomes obliterated in its entire length after a locally circumscribed lesion. This can be demonstrated by arteriography. Frequently one can observe that in thrombosis of one artery, circulatory disturbances, pain, and coldness develop also in the contralateral leg. After resection, pain and circulatory disturbances cease in the contralateral leg first, immediately after the operation, and only much later in the extremity subjected to operation. The mechanical obstruction of the artery is not the only cause of the circulatory disturbance. Irritation of the arterial wall leads to vasoconstriction of the blood vessels, and, to a lesser degree, of the contralateral leg and may also cause other disturbances of the entire sympathetic nervous system. Therefore, in some cases, lumbar sympathicotomy should be added to the resection of the artery.

The operation is most successful in thrombosis and arteriosclerosis, less in arteritis of various origins. In endarteritis obliterans the outcome is less satisfactory, and resection of the lumbar sympathicus should be done in all these cases in addition to resection of the artery. Also in ulcers and threatening gangrene the operation sometimes leads to a successful outcome.

Of the numerous functional tests, continuous registering of the skin temperature proved the most reliable. After a water bath of 15° C. for 15 minutes the leg is put under a heat cradle at 50° C.

The oscillatory index is much less reliable.

WERNER M. SOLMITZ, M.D.

BLOOD; TRANSFUSION

Experimental Study with Blood Transfusions (Studio sperimentale sulle trasfusione di sangue). VINCENZO LAUDICELLA. *Arch. ital. chir.*, 1948, 70: 91.

The author conducted an experimental study on dogs, to determine the fate of transfused blood, for which he received the Achille Albanese award from the University of Palermo.

He developed an internal biliary fistula in dogs. At first the gall bladder was anastomosed directly to the right renal pelvis after the common duct had been ligated, but this procedure resulted in a high mortality. He then made the anastomosis through the body of the kidney to the pelvis, and by so doing the mortality was reduced to zero. Eight dogs were operated upon in this manner. Following recovery from the operation the amount of bilirubin excreted was determined daily and a standard was set for each animal. Four dogs were then transfused with compatible blood varying from 20 to 100 c.c. The other 4 dogs were transfused with similar amounts after an amount of blood equal to that to be transfused was first removed. The amount of bilirubin was determined as previously.

From the results of these experiments, the author arrived at the following conclusions:

1 The blood transfusions were constantly followed by an increase in the bilirubin excreted. This increase began within 24 hours and lasted for a variable length of time up to 20 days—an average of 16 days.

2. Blood-letting previous to the transfusion did not influence the amount of bilirubin excreted.

3. The amount of bilirubin excreted, in excess of normal, was proportional to the amount of blood transfused.

4. The post-transfusion hemolytic phenomena, of which the excess of bilirubin excreted constitutes a direct index, are proportional to the quantity of blood transfused, and indicate the destruction of an amount of blood equal to that transfused.

The destruction of transfused blood cells does not represent a normal cycle for red blood cell destruction. In the experiments, the transfused blood was apparently destroyed within 20 days, an average of 16 days for the 8 dogs; the bilirubin excretion levels then returned to normal. According to the experimental work of Hawkins and Whipple, as well as others, the life cycle of red blood cells in dogs is about 124 days, and hence represents a much longer period than the life cycle of transfused red blood cells, as these experiments would seem to indicate.

LUCIAN J. FRONDUTI, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Prothrombin Activity. RACHEL S. SANDROCK and EARLE B. MAHONEY. *Ann. Surg.*, 1948, 128: 521.

Postoperative prothrombin activity was studied in 382 surgical patients. In this series 80 per cent of the patients did not show any signs of hyperprothrombinemia in the blood and did not give any evidence clinically of thromboembolism. In the remainder, hyperprothrombinemia was detected before the onset of clinical signs of thrombophlebitis.

The authors found that in the first 3 days of recovery after operation an increase of prothrombin activity in the blood became the precursor of thromboembolic phenomena in the patient. Dicumarol was administered prophylactically to 23 patients because of the sudden increase in prothrombin activity.

The authors thought that the dilution prothrombin test was too variable; therefore, the prothrombin activity of whole plasma was used for the test.

It was often found that when clinical signs of thrombosis were present prothrombin activity in the blood was already reduced or normal. It was thought that the hyperprothrombinemia discovered on the third postoperative day manifested the onset of thrombosis in the small veins of the leg. The test was not considered accurate for all cases because not every patient with hyperprothrombinemia developed clinical thrombosis.

BENJAMIN G. P. SHAFIROFF, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Traumatic Lesions of the Thumb of Recent Origin (Lesiones traumaticas recientes del pulgar). PEDRO V. PEDEMONTE. *An. ortop. traumat.*, 1948, 1: 97.

Of three functions of the hand—exploration of the objects, gesticulation, and exertion of pressure—the last mentioned is the most important. The thumb is of greatest value for exerting pressure.

The author makes a plea for conservative surgical treatment of traumatic lesions of the thumb, illustrating the description of various methods by examples from his own practice.

A poor stump is preferable to a complete loss of the thumb, because it may be reconstructed. Various plastic procedures may transform a useless thumb into a useful organ.

In a complete avulsion of the soft parts there is a general tendency to place the torn tissues back into their original position and to suture them. However, the late results of such treatment are very unsatisfactory, due to necrosis of the skin. The author prefers to treat traumatic lesions by débridement, proper immobilization, and replacement of the injured tissues by a skin flap, preferably taken from the abdomen at a later date. After transplantation, the injured arm is placed in a body cast.

If a bone is crushed, a subperiosteal extirpation is recommended.

The author advocates lavage of the wound with copious amounts of an antiseptic solution. In very extensive injuries, if the tendons cannot be identified and properly sutured, at least an effort should be made to preserve the nerves, to avoid an annoying anesthesia. As a rule, the cast is removed after from 6 to 8 weeks.

If an extensive defect of the skin is present, one of three methods may be employed: (1) the wound may be allowed to heal by second intention, (2) it may be sutured, or (3) a plastic repair may be performed. The first two methods are condemned because they produce painful scars.

Loss of the distal phalanx is estimated to cause 10 per cent disability, loss of the proximal phalanx, 30 per cent, and loss of the thumb, including the corresponding metacarpal bone, 35 per cent.

JOSEPH K. NARAT, M.D.

Suppurative Fasciitis as the Essential Feature of Hemolytic Streptococcus Gangrene. E. L. MCCAFFERTY, JR., and CHAMP LYONS. *Surgery*, 1948, 24: 438.

The term "necrotizing erysipelas" was introduced to designate a specific infection due to beta hemolytic streptococci, and characterized by subcutaneous necrosis and secondary cutaneous gangrene. Early surgical incision "to the limits of the subcutaneous necrosis" were demonstrated to be effective in the control of the spreading infection.

The clinical picture of the disease is well known. It most commonly affects the extremities. The pathognomonic sign of the disease has been described as a "dusky hue of the skin with or without blisters or bullae and usually appearing on the third, fourth or fifth day" of the infection. Before potent antistreptococcal therapy was available, multiple incisions of the bear-scratch type were lifesaving. The wounds were then "dakinized" and the considerable defects pinch-grafted 6 to 8 weeks later.

The authors present certain modifications in our understanding of this disease, as a consequence of their experience with penicillin-treated infections. The conclusion that the disease was an anaphylactic phenomenon of the Schwartzman or Arthus type has been brought forward. In studies of penicillin-treated infections the subcutaneous necrosis has been limited quite clearly to a suppurative fasciitis. Hemolytic streptococcus gangrene is an extensive cellulitis which, even under modern therapy, is frequently complicated by abscesses of the fascial planes.

Recognition of suppurative fasciitis as the essential feature of hemolytic streptococcus gangrene has

simplified its clinical management. The diagnosis and surgical incision should not be deferred for the appearance of the older pathognomonic sign of impending cutaneous gangrene. Recognition of persistent edema along a fascial plane in an infection otherwise subsiding under antistreptococcal therapy is indicative of a fascial plane abscess.

The bear-scratch type of incision has been discarded in favor of planned fasciotomy incisions designed to expose the entire length of the fascial plane abscess. The most effective method of avoiding long incisions is early recognition of fascial plane edema and prompt surgical intervention. After drainage a fine mesh gauze is introduced into the wound and the extremity is immobilized by a gentle pressure dressing.

Early secondary closure of these frequently considerable defects has proved practical and desirable.

HARRY W. FINK, M.D.

Antibiotic Therapy. EMANUEL APPELBAUM and WILLIAM A. LEFF. *J. Am. M. Ass.*, 1948, 138: 119.

The authors have frequently observed that during the course of treatment with an antibiotic a complete change in the bacterial flora may occur. The pathogenic organisms that are sensitive to an antibiotic in use disappear or become less numerous, and insensitive organisms may appear in large numbers and cause a new infection. The authors reported in great detail 2 cases of pneumococcic pneumonia treated with penicillin, in which there developed a new infection due to gram negative bacilli which responded to streptomycin. They strongly emphasized the occurrence of superinfections as an important and hitherto poorly appreciated feature of antibiotic therapy in general. The importance of frequent and careful bacteriologic examinations in all patients before and during treatment with an antibiotic was stressed in order to detect the presence of superinfections.

The authors do not, however, advocate the combined use of two different antibiotics from the start of treatment of infections because, first, these drugs may sensitize certain patients to their use later in life and, secondly, the incidence of the occurrence of superinfections does not appear to be high enough to warrant such a practice. ROBERT TURELL, M.D.

Penicillin Therapy. N. ERCOLI, W. C. HUEPER, L. LANDIS, B. S. SCHWARTZ, and F. J. QUEALLY. *J. Am. M. Ass.*, 1948, 138: 115.

During the past few years the numerous investigations conducted with a view to the development of a simple and efficient method for maintaining and prolonging an effective blood level of penicillin culminated in the development by Romansky of a penicillin-wax-oil mixture, but because this preparation has a high melting point and viscosity requiring special syringes, and in view of the occasional occurrence of painful indurations at the site of the injection, there arose a need for the development of an injectable preparation of penicillin which can be handled at ordinary room temperature and which does not produce appreciable untoward reactions while possessing superior therapeutic properties.

The observation that small doses of epinephrin suspended in oil exert a strong delaying effect prompted Ercoli and his collaborators to incorporate potassium penicillin into a vehicle of this composition. The quantity of epinephrine added to the oil was kept sufficiently low to assure a prolonged local vasoconstrictor action without causing any systemic vasopressor effect. The authors presented evidence to show that their mixture of 300,000 units of potassium penicillin, 0.3 mgm. of epinephrine, and 1 c.c. of vegetable oil, produces after the intermuscular injection, and particularly after the subcutaneous injection, an effective blood penicillin level for periods of 16 to 24 hours. This preparation is easily handled with syringes and needles which ordinarily are available. ROBERT TURELL, M.D.

Aureomycin. MORTON S. BRYER, EMANUEL B. SCHOENBACH, CAROLINE A. CHANDLER, ELEANOR A. BLISS, and PERRIN H. LONG. *J. Am. M. Ass.*, 1948, 138: 117.

Aureomycin is a new antibiotic and is derived from a strain of Streptomyces aureofaciens. It possesses bacteriostatic and bactericidal activity against numerous gram positive and gram negative bacteria. It is supplied in acid solutions having a *p*H of 4.5. The activity of the antibiotic deteriorates rapidly in alkaline solutions at room temperature. Human serum also decreases its activity. The $L.D._{50}$ [lethal dose for 50 per cent of test objects] on intravenous injection in mice is between 50 and 100 mgm. per kilogram of body weight. The $L.D._{50}$ on subcutaneous injection in mice is between 3,000 and 4,000 mgm. per kilogram of body weight. Rapid intravenous injection of 150 mgm. per kilogram of body weight killed a dog and produced hemoglobinuria.

Repeated large doses of aureomycin were tolerated in rats and dogs, with moderate local reaction and some loss of weight associated with anorexia. Autopsy revealed no gross or microscopic abnormality in the viscera. A rabbit tolerated 1 per cent aureomycin borate administered locally in the eye. The concentrations of the antibiotic in serum ranged from 0.3 to 2.4 micrograms per milliliter. The antibiotic was not detected in the spinal fluid. High concentrations of aureomycin were noted in the urine.

Aureomycin administered to mice orally did not protect against infections produced by pneumococcus type I, or Klebsiella pneumoniae type A, but did protect against those produced by Streptococcus hemolyticus beta (C203). Parenteral doses gave some protection against all three infections. Penicillin afforded slightly more protection against infections produced by gram positive bacteria, while polymycin and streptomycin were superior in experimental infections produced by Klebsiella pneumoniae.

Patients suffering from coli-aerogenes and Streptococcus faecalis infections of the urinary tract,

Rocky Mountain fever (Eastern type), typhoid, and brucellosis have been treated with aureomycin, which was administered orally, or both orally and intramuscularly. The oral dosage employed varied from 10 to 60 mgm. per kilogram of body weight per day, given in from 6 to 12 doses. Intramuscularly, a total dosage of 3 mgm. per kilogram of body weight per day, divided into 4 doses, was tolerated, but with signs of moderate local irritation. The 5 patients with Rocky Mountain spotted fever, who were treated on the third to fifth day of their disease, were afebrile and asymptomatic within from 12 to 72 hours. A patient ill with chronic brucellosis, whose blood cultures were repeatedly positive for Brucella suis, became afebrile 3 days after the institution of aureomycin therapy. Blood cultures became sterile 48 hours after treatment was begun. As of the date of reporting, these had remained sterile, and the patient had remained afebrile and asymptomatic for more than 2 months. Infections of the urinary tract due to coli-aerogenes and Streptococcus faecalis have been sterilized, and evidence of inflammation has disappeared when patients were treated with aureomycin by mouth.

Two patients with typhoid were treated, with favorable initial responses.

ROBERT TURELL, M.D.

ANESTHESIA

The Role of Epinephrine in Analgesia. E. G. GROSS HELEN HOLLAND, H. R. CARTER, and EUNICE M. CHRISTENSEN. *Anesthesiology*, 1948, 9: 459.

The potent analgesic agents have been assumed to exert their pain-relieving action through a depression of the thalamic region of the central nervous system. The use in various laboratories of improved methods for measuring analgesia, however, has revealed several indications that the autonomic nervous system may also be involved in the production of analgesia.

It is believed that the results of this study may establish that epinephrine plays a role in the mechanism of analgesia, and evidence appears that this may be a vascular effect. Perhaps the vascular effect results in a hypoxic state in the nerve tissue. The exact mechanism, however, by which a vascular change might bring about the analgesia, and the central or peripheral nature of the analgesia requires further experimentation.

MARY FRANCES POE, M.D.

Local Sequelae of Endotracheal Anesthesia. W. ALLEN DONNELLY, ARNOLD A. GROSSMAN, and FRANCIS M. GREM. *Anesthesiology*, 1948, 9: 490.

The types of trauma incident to endotracheal anesthesia are discussed, and the findings on postanesthetic indirect (mirror) laryngoscopic examinations in 100 cases are described. Even with residents recently introduced to the endotracheal technique, the local damage following intubation was, in all cases, moderate in degree and caused only minimal subjective complaint or functional change. No permanent damage was encountered.

It is not unreasonable to assume that in the hands of the skilled anesthesiologist, the incidence of trauma resulting from intubation will be minimal and that the occurrence of even slight injuries (noted in this series) will be less frequent. The advantages of endotracheal anesthesia which have not been discussed in this paper far outweigh any minor undesirable effects discovered in this study.

MARY FRANCES POE, M.D.

Intravenous Procaine in Thoracic Surgery. N. M. BITTRICH AND W. F. POWERS. *Current Res. Anesth.*, 1948, 27: 181.

The authors report and summarize the use of continuous procaine infusion intravenously in combination with other agents, such as cyclopropane, ether, and pentothal, during thoracic operations on 17 patients. The procaine infusion was employed in the particular attempt to control cardiac irregularities occurring in patients undergoing thoracic surgery.

Preoperative medication with nembutal, morphine sulfate, and scopolamine was used. The patients were anesthetized with cyclopropane, nitrous oxide-oxygen-ether, or pentothal nitrous oxide-oxygen-ether, and intubated with intratracheal tubes. Transfusion was begun and the patient was placed in the operative position. Assisted or controlled respiration was used as indicated. Before the pleural cavity was opened a continuous intravenous infusion of 1.0 per cent procaine hydrochloride in 5 per cent glucose solution was begun. Small amounts of pentothal were given intravenously from time to time to reduce the convulsant effects of the procaine.

In 5 of 17 cases arrhythmia occurred although the procaine solution was flowing at rates from 60 to 100 drops per minute. A rate of 150 drops per minute was required to correct arrhythmia in one patient. This has raised the question as to whether or not a single dose of from 50 to 100 mgm. can be expected to control cardiac arrhythmia, especially if it is the result of more serious cardiac dysfunction than was present in these patients. Mild convulsions occurred during ether anesthesia in 4 patients whose disease was bronchiectasis and who had received insufficient amounts of pentothal. This appears to refute the suggestion that the susceptibility to the convulsant effects of procaine is diminished during general anesthesia. No harmful effects were seen in these cases.

The case reports emphasize the diminution of bronchospasm and coughing and the ease with which both could be controlled with the intravenous administration of procaine. The patients appeared to tolerate operations better and made easier recoveries. No patient who had been given procaine had any immediate sensation of pain upon awakening.

MARY KARP, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

The Diagnosis of Suprasellar Tumors by Pneumoencephalography. N. S. SCHLEZINGER and J. GEORGE TEPLICK. *Am. J. Roentg.*, 1948, 60: 213.

The authors reviewed the pneumoencephalographic findings in 5 patients in whom a diagnosis of suprasellar neoplasm had been made, in an attempt to determine whether a conclusive diagnosis of tumor in the suprasellar region could be made early by means of routine pneumoencephalography. This survey disclosed a striking alteration in the appearance of the cisterna chiasmatis, best described as obliteration, in 4 cases in which the existence of a meningioma in the suprasellar region had been verified by operation, and in another case in which the presence of a hypophyseal duct tumor is highly probable.

A control study of 150 consecutive pneumoencephalograms in which no suprasellar lesion was suspected shows 94 per cent visualization of the cisterna chiasmatis; therefore, the authors conclude that obliteration of the cisterna chiasmatis warrants the presumptive diagnosis of a suprasellar tumor if a lesion in this area is clinically suspected.

FRANK L. HUSSEY, M.D.

The Pathologic Gall Bladder. FRANK GREENWOOD and E. SAMUEL. *Brit. J. Radiol.*, 1948, 21: 438.

The authors present an analysis of their cholecystographic studies of 500 consecutive cases of pathologic gall bladder. Routinely they used a "single" dose of dye, and administered additional dye only in those cases which showed poor original concentration. Of those gall bladders thought to be normal, 9.9 per cent required the additional doses of dye. Fluoroscopic examination with compression and spot filming was employed routinely. The authors state that with this technique they are better able to avoid overlying gas shadows. Further, they believe that this part of the examination is just as important as the comparable fluoroscopic and roentgenographic examination of the duodenal cap in the erect position. Films were always made in the erect position, since this view was the only one which revealed 18 per cent of the nonopaque gall stones. When overlying gas shadows were particularly disturbing, the demonstration of nonopaque stones was aided by the use of tomography. PAUL W. EYLER, M.D.

Contribution to the Radiological Study of Simultaneous Skin and Bone Manifestations in the Legs (Contribution a l'étude radiologique des modifications osseuses et cutanées concomitantes dans la région des jambes). RENÉ GILBERT and GEORGES VOLUTER. *Acta radiol.*, 1948, 29: 403.

Bony reactions accompanying soft tissue alterations in the legs have long been known to radiologists. Do they follow or precede the modifications of the soft tissues? Do they result from local or systemic reactions? After a short summary of the literature the authors elaborate their theory.

Periostosis being a constant and important finding, its macroscopic and microscopic pathology is outlined. The periosteum is a conjunctive membrane which cannot be detected with x-rays even if it has been raised from the adjacent bone by a mass of blood or pus. It will be seen only if mineralized or ossified.

The first stage of periosteal reaction in repair processes consists in the production of a reticulum of osteoid, calcium-free trabeculation which is radiolucent.

In the second stage, which constitutes the first roentgenological evidence, there is mineralization of the periphery of this reticulum which leaves a clear space between it and the underlying bone. This occurs toward the twentieth day.

Finally, the clear zone becomes ossified and continuous with the cortex of the bone and the roentgenogram shows it as a thickening of the cortex. This is true of acute cases.

In chronic processes, periostosis will, in most instances, be produced intermittently and show a lamellar appearance on the films. Fundamental roentgenological signs are then discussed.

1. There are morphological and structural modifications of the bone such as osteoporosis, osteosclerosis, and periostosis, alternately or simultaneously and intermingled. It is interesting to note that osteoporosis of the head and malleolus of the fibula is an early sign, although the lesions are usually closer to the tibia. This is due to the fact that the volume of the fibula is considerably less than that of the tibia. Periostosis, on the other hand, is seen almost as early in either bone. The interpretation is, of course, more difficult in the aged in whom periostosis already exists.

2. Other modifications such as calcifications of the interosseous membranes, tendons, muscles, phleboliths, and even arteriosclerosis occur later in the soft tissues.

The basic condition is most likely venous stasis which gives rise to skin, soft tissue, and osseous manifestations. In varicose ulcers, the osseous condition does not precede the vascular alterations, but it is detected earlier. Furthermore, discrete osseous reactions are usually seen in the other leg which is free of ulcer.

In primary skin conditions such as tuberculosis or ulcus rodens the bony changes are localized and occur without proportion to the lesions. In osteomyelitis, the alterations are seen much earlier in the soft tissues than in the bones.

In periostosis such as is seen in varicose conditions, the first stage only is active. The two last stages are

passive and subjected to the laws of tissue growth and hormonal regulation. In this respect the process is similar to that seen in some generalized infections, such as syphilis and certain types of intoxications.

JEAN P. JEAN, M.D.

A Decade of Experience with Plesioroentgenotherapy in Tumors of the Skin and Mucosa (Un decennio di esperienza nella plesioroentgenterapia dei tumori della cute e delle mucose). C. PORTA. *Tumori*, Milano, 1948, 34: 119.

Plesioroentgenotherapy (PRT) has been employed at the National Institute for the Cure of Tumors at Milan, Italy, in 605 cases during the period from 1935 to 1944. The apparatus used was the original type of Chaoul's (Sieman's tube). The factors for its function are: 55 kv., and 4 ma., with a focal distance of 5 cm. and filtration equivalent to 0.2 mm. of copper. The field chosen for irradiation was never larger than 3 cm. in diameter. The usual dosage consisted of 6,000 roentgens in fractional doses of from 500 to 600 roentgens daily on consecutive days. In the cases of melanoblastoma the dosage was higher, at times reaching 10,000 roentgens in a single course, or even from 20,000 to 25,000 roentgens in two or more courses. For the recurrences which developed after some years, the dosage and fractionation was the same as for the original course; in the more recent recurrences, however, the dosage was somewhat smaller (from 4,000 to 5,000 roentgens) with fractions of from 300 to 400 roentgens in some cases; nevertheless, in the majority of these patients the fractionation ranged from 500 to 600 roentgens.

The total rate of cure was 54 per cent; however, only 416 of the patients were available for later control studies and the cures, when based on this number, amounted to 82 per cent. These figures, however, do not faithfully mirror the results of treatment since they included many patients with tumors notoriously resistant to irradiation therapy (melanoblastomas and tumors of the internal angle of the eye). Many of the latter patients, although cured locally, later developed distant metastases of the lymph glands, and these were, unfairly perhaps, included among the figures for failure of cures. Seven "before and after" photographic reproductions illustrate the excellent cosmetic results obtained and the absence of trophic sequelae in the irradiated skin areas.

The lesions treated included newgrowths of the buccal and nasal mucosa, the mucosa of the prepuce and clitoris, tumors of the skin, and tumors of the ocular and, especially, corneal conjunctiva. Best adapted to this form of treatment seemed to be the neoplasms of the bridge of the nose, the internal angle of the eye, and the lobe of the ear. In these cases the results were satisfactory as far as local cure and freedom from recurrence were concerned, and there were fewer reactions and necrotic degenerative changes of the underlying cartilage than following treatment with radium or other forms of irradiation. Excluded were the highly malignant, deeply infiltrating growths which are suitable for radium therapy. Nevertheless, the method could be applied also in some of these cases, particularly for tumors developing upward from the skin surface where the protruding masses or growth could previously be removed by diathermic exeresis. Tumors more than 3 cm. in diameter could also be treated by contact therapy when the area could be irradiated in several contiguous fields.

The author regards plesioroentgenotherapy (contact therapy) as the method of choice for tumors of the skin and mucosa, always, of course, on the basis of its inherent limitations and provided that the method be applied with a rigidly correct technique.

JOHN W. BRENNAN, M.D.

Colloidal Lead Orthophosphate Associated with Deep Roentgen Therapy in Bone Metastases from Cancer of the Breast. LAWRENCE REYNOLDS, T. LEUCUTIA, JAMES C. COOK, and KENNETH E. CORRIGAN. *Am. J. Roentg.*, 1948, 60: 193.

The authors treated 355 cases of bone metastases chiefly from carcinoma of the breast with preliminary intravenous injection of colloidal lead orthophosphate in conjunction with roentgen therapy. The present method consists of intravenously injecting an average dose of 30 c.c. of colloidal lead orthophosphate suspension containing 120 mgm. of lead. This in 3 days is followed by a series of deep roentgen treatments. As a rule, the rays obtained with 200 kv. and 1 mm. of copper are used, and full erythema doses are given per field at one seance. The number of fields selected for crossfiring depends on the physical measurements of the part of the body to be irradiated. Occasionally in very heavy patients, supervoltage roentgen therapy is employed because of greater depth dose. The entire series is completed in a period of from a few days to 2 weeks. Hospitalization of from 20 to 30 per cent of the cases is necessary because of severe treatment reactions. The injection of the colloidal lead is repeated 2 months later and followed again in 3 to 4 days by a second series of deep roentgen treatments. The reaction is usually less severe. Additional treatment series may be given if there is additional spread of the carcinoma. In one case a total of 1,200 mgm. of colloidal lead orthophosphate was injected over a period of 10 years with twelve series of deep roentgen treatments with gradually reduced doses. The only contraindications to the administration of the colloidal lead are severe liver damage, nephritis, and very marked anemia. In about 20 per cent of the cases the intravenous injection of colloidal lead orthophosphate is followed within 1 to 2 hours by a chill and a temperature elevation reading up to 103° F.

The symptomatic improvement has been satisfactory in 95 per cent of the cases. The complaints in conjunction with the invasion of the osseous skeleton by the malignant neoplasms begin to abate in about 10 to 14 days. In 3 months there is very solid reossification of the formerly destroyed areas

of the bone which permits resumption of limited activities. The average survival amounted to 3 years. In 4 per cent the survival was more than 5 years. The patient who survived longest lived 10 years, but there were no permanent cures.

The preliminary intravenous injection of colloidal lead orthophosphate in conjunction with roentgen therapy leads to a three-fold effect in the malignant neoplastic invasion of the osseous system; the lead has a certain toxic action in itself; there is a direct destructive effect of the roentgen rays; and the heavy lead atoms deposited within the tumor area emit, under the influence of roentgen irradiation, ionizing secondary electrons which also act on the carcinoma cells. More recently, attempts were made to use radioactive lead orthophosphate to aid internal irradiation. However, further investigations, especially with "tagged" lead, are necessary before worthwhile therapeutic efforts can be undertaken.

FRANK L. HUSSEY, M.D

The Use of Adrenal Cortical Hormone in Radiation Sickness. FRIEDRICH ELLINGER. *Radiology*, 1948, 51: 394.

The symptomatology of radiation sickness points to adrenocortical insufficiency. Irradiation of a sufficiently large volume of the body results in the release of histaminelike substances, if not of histamine itself. These substances cause the anterior pituitary to secrete a corticotrophic hormone, which in turn stimulates adrenocortical activity. This stimulation may well result in exhaustion of the gland.

In a recent study with mice as the test objects, the author used desoxycorticosterone acetate (DCA), a synthetic hormone of the adrenal cortex, in the treatment of radiation sickness. It was demonstrated that DCA protects the liver against radiation-induced fatty changes and that this liver-protecting action is accompanied by a decrease in the mortality rates produced by various doses of x-rays applied in total body irradiation. It was demonstrated, furthermore, that both effects are dependent on the size of the daily dose of DCA; 0.5 mgm. was found to be an optimal dose for daily administration. The lethal effect of L.D. 50 was reduced by almost 50 per cent.

The author's studies were extended to include the influence of DCA on the effects of x-rays on the spleen, bone marrow, and adrenal cortex. One-hundred male Swiss white mice were given total body irradiation and then killed at different intervals. The results of the study of the spleen, bone marrow, and adrenal cortex in animals which were irradiated, and in those which were irradiated and treated daily with 0.5 cm. DCA were compared. The author observed no change in the x-ray induced effects on the spleen. On the bone marrow, however, a definite and statistically relevant change was noticeable in the DCA treated group. Similarly, a decreased depletion of sudanophile fat of the adrenal cortex was observed in the animals receiving DCA.

In a series of 50 patients who exhibited nausea or vomiting, or both, 37 were completely relieved of these distressing symptoms. It is believed that DCA may prove of value not only in the treatment of radiation sickness encountered as a complication of radiation therapy, but also in radiation sickness occurring as a result of accidental exposure to lethal doses of ionizing radiations.

FRANK L. HUSSEY, M.D.

MISCELLANEOUS

Radioactivity and Urinary Tract Calculi. DAVID S. CRISTOL, ALBERT E. BOTHE, and PAUL W. GROTZINGER. *N. England J. M.*, 1948, 238: 427

The authors report a very interesting case of radioactivity of a bladder stone.

The patient, a male 56 years of age, who had a vesical calculus as well as multiple prostatic calculi, was also afflicted with polycythemia vera. Preparatory to the operation for the calculi, orally radioactive phosphorus for the polycythemia was administered. He received a first dose of 6 millicuries, and 5 months later a second dose of 10 millicuries. During all this time the increase in size of the bladder calculus was observed by means of repeated roentgen studies and cystoscopic examinations. Sixty-one days after the second oral dose of radioactive phosphorus, a suprapubic cystotomy was performed and the vesical calculus together with some of the prostatic calculi were removed.

The stones then were analyzed for radioactivity. Both the Geiger counter and the autoradiographs showed that the vesical calculus was markedly radioactive. There was a laminated layer at the periphery, which represented deposited radioactive phosphorus from the urine. This layer corresponded to the increase in size of the stone during the period of administration of the drug. The prostatic calculi, which were not in contact with the urine and also were presumably not enlarging during the period of phosphorous therapy, were not radioactive.

It is the authors' opinion that the method might serve as a control of the efficacy of various proposed procedures for the prevention of additional stone formation, as, for example, the effect of an acid ash diet on the formation of alkaline stone. It also offers an opportunity for the study of the action of radioactive materials on associated infections of the urinary tract. The possible effect of the radioactive stone on the surrounding tissues must also be considered.

T. LEUCUTIA, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Some Supplementary Leads in Clinical Electrocardiography. KARL ERIK GREWIN. *Acta med. scand.*, 1948, 130: Supp. 209.

Considerable interest has been evidenced in electrocardiographic circles with regard to special leads. The author presents an adequate historical résumé of the subject, and reviews the contributions of many authors in Europe and the United States.

His critical evaluation of the many reports contained in the bibliography of the text are objective and interesting. The author also presents a report of his own experience in the field.

CHAUNCEY C. MAHER, M.D.

The Effects of Altered Arterial Tensions of Carbon Dioxide and Oxygen on Cerebral Blood Flow and Cerebral Oxygen Consumption of Normal Young Men. SEYMOUR S. KETY and CARL F. SCHMIDT. *J. Clin. Invest.*, 1948, 28: 484.

The effects of the inhalation of 5 to 7 per cent CO_2, 85 to 100 per cent O_2, and 10 per cent O_2 were studied on the composition of arterial and internal jugular blood; on blood flow, oxygen consumption, and vascular resistance of the brain; and on cardiac output and blood pressure.

CO_2 inhaled in concentrations of 5 to 7 per cent produces an increase in cerebral blood flow averaging 75 per cent; O_2 inhaled in concentrations of 85 to 100 per cent is associated with a reduction in cerebral blood flow of 13 per cent, while 10 per cent O_2 produced an increase of 35 per cent in this function.

These changes are statistically significant. Calculation of cerebrovascular resistance indicates that in every case the change in blood flow is due to a change in the vascular resistance of the brain. Cerebral oxygen consumption is not significantly altered by changes in the composition of inspired air over the ranges studied. Mean arterial blood pressure rose significantly during the CO_2 and high O_2 inhalations and fell slightly with 10 per cent O_2. The only significant change in cardiac minute volume was an increase which occurred during 10 per cent O_2 inhalation and resulted from an increase in rate rather than stroke volume. WALTER H. NADLER, M.D.

The Effects of Various Amino Acids on Peripheral Blood Flow and Skin Temperature. MARTIN B. MACHT. *J. Clin. Invest.*, 1948, 28: 454.

Skin and rectal temperatures, total oxygen consumption, and blood flow through the hand were studied in 4 healthy young males before and after the oral administration of seven amino acids.

At an environmental temperature of 24° centigrade, glycine produced a significant rise in the skin temperature of the hands and, in the dosage used, resulted in a significant increase in blood flow through the hand. These increases generally became apparent about 80 minutes after the glycine ingestion and were most marked after about 180 minutes. Save for similar but less marked increases in toe temperature, no significant temperature changes were noted elsewhere in the body, including the rectum. At 18° centigrade and 30° centigrade, no significant changes in rectal or skin temperature, or peripheral blood flow followed the administration of glycine. At an environmental temperature of 24° centigrade, changes similar to those produced by glycine were observed after the administration of dl phenylalanine; only a very slight and questionably significant increase in hand skin temperature and blood flow through the hand were noted after 1 (+) histidine monohydrochloride; no effect was produced upon rectal or skin temperature or on the peripheral blood flow after ingestion of 1 (+) glutamic acid, 1 (—) tyrosine, 1 (—) leucine and dl methionine.

Although five of the seven amino acids used caused a definite increase in oxygen consumption, there were no consistent quantitative relationships between total oxygen consumption and skin temperature or peripheral blood flow.

WALTER H. NADLER, M.D.

The Effects of the Rate of Administration of Amino Acid Preparations on Urinary Wastage of Amino Acid Nitrogen in Man. CHARLEY J. SMYTH, STANLEY LEVEY, and ANDREW G. LASICHAK. *J. Clin. Invest.*, 1948, 28: 412.

In 15 human subjects, a comparison was made of the urinary loss of amino acid nitrogen in a 4 hour period after the administration of three different amino acid preparations, each containing 5.4 gm. of nitrogen. In 5 of these subjects the amino nitrogen content of the urine was determined for the same period after an infusion of physiological salt solution. The protein hydrolysate injection rates used were those shown by previous experience to approach the maximum tolerated rate of the majority of the patients. The greatest urinary amino acid nitrogen wastage occurred with the solutions prepared by the enzymatic hydrolysis of casein, which preparation contained large amounts of peptide nitrogen. The increased loss of total amino acid nitrogen seemed to be due mainly to "bound" amino acid nitrogen. In a 4 hour period the per cent of the total administered amino acid nitrogen lost in the urine ranged between 1.6 and 19.7 per cent. After the administration of either an acid hydrolysate of casein or a mixture of amino acids under similar conditions, usually only 3 to 5 per cent of the total amino acid nitrogen was found in the urine. In contrast, there was little free amino acid nitrogen lost after the administration of any of the preparations studied regardless of the speed of infusion. Mixtures of amino acids, if well

tolerated, can be given at exceedingly rapid rates without causing increased spillage into the urine.

WALTER H. NADLER, M.D.

Is Tuberculosis Present or Not? Histologic Examination or Inoculation? (Y a-t-il tuberculose ou non? Examen histologique ou inoculation?) EUGÈNE URECH. *Helvet. chir. acta*, 1948, 15: 125.

After the inoculation of guinea pigs with the fluid obtained from 40 patients with pleurisy, the author obtained positive results in only 12 instances, or 30 per cent. The clinical examination left no doubt concerning the tuberculous origin of the condition. Of 30 patients with tuberculous adenitis, only 6 gave positive results on inoculation of guinea pigs.

The glands removed from the aforementioned group of 30 patients were studied histologically. Of 50 sections 48 showed signs of tuberculosis. Only in 2 cases the results were negative with regard to tuberculosis. In one of them the inoculation had given a positive result in an initial stage of the tuberculosis, while in the other case the cicatrization was so complete that no more signs of a specific lesion could be detected. All the glands were removed from the abdominal cavity. Similar results were obtained with tuberculous cervical ganglia: in only 1 of 5 cases was the result of the inoculation positive, while histologic study established the diagnosis of tuberculosis in the 4 others. The process was in full stage of evolution in all instances.

The third series of tests dealt with tuberculous material of various origins, collected in the course of operations. In only 6 of 10 tests was the inoculation positive, while histologic examination demonstrated the presence of tuberculosis in every instance.

If a surgeon is confronted with the question: "Is tuberculosis present or not?" undoubtedly the histologic examination will furnish the most reliable reply. In 99 per cent of the cases a negative inoculation does not determine whether active microbic activity is present or not. An investigation should be made to ascertain whether as small a number of bacilli as is generally assumed is sufficient to infect a guinea pig with tuberculosis.

JOSEPH K. NARAT, M.D.

Effect of Oral Caronamide on Plasma Penicillin Levels Following Large Intramuscular Doses of Penicillin. ALBERT O. SEELER, HARVEY SHIELDS COLLINS, and MAXWELL FINLAND. *Am. J. M. Sc.*, 1948, 216: 241.

Because of the rapid renal clearance of penicillin, numerous agents have been examined for their ability to block the tubular excretion of this antibiotic and thereby enhance the plasma levels obtainable from any given dose. While diodrast and para-aminohippuric acid are effective in this regard, their usefulness is restricted because of the need of large amounts by vein. Reports concerning the value of benzoic acid or sodium benzoate have been at variance.

The present study was undertaken to determine if caronamide, given by mouth, significantly enhances penicillin blood levels in man by reversibly inhibiting its excretion following the administration of single doses of 1 million units. Seven patients over 60 years of age, and 10 patients under 60 years were studied. Only those without any evidence of cardiac and renal disease were selected. Caronamide was given by mouth in tablet form, the older people receiving 2 gm., and the younger, 4 gm. every 4 hours after administration of the penicillin. Plasma penicillin levels were determined at suitable intervals before, during, and after caronamide therapy. Two patients under 60, and 2 patients over 60 years of age, in whom caronamide was significantly effective, were later studied with sodium benzoate, beginning with 2 gm. and repeating with 4.5 gm. after a few days.

In 6 of the 7 patients over 60 years, caronamide therapy enhanced the penicillin levels strikingly. Six hours after the penicillin was administered the levels with caronamide were about 10 times as high as those without caronamide, and after 24 hours the penicillin level with caronamide averaged about .16 units, whereas at this time no penicillin could be detected in the control plasma. While the degree of enhancement varied widely in patients under 60, the plasma penicillin levels without exception were definitely higher during caronamide therapy than in the control period. After 4 hours the average difference was about 15 fold. Without caronamide, little or no penicillin remained in the plasma 8 and 12 hours after the injection, while with caronamide, 5 of the 10 patients evidenced penicillin levels as late as 18 hours.

Sodium benzoate had little if any effect on the penicillin level when given in doses of 2 gm. every 2 hours. When larger doses were administered, the level was somewhat enhanced in 1 patient but not in the other 3. The only untoward sequelae to caronamide therapy were nausea in 4 patients with vomiting in 2 of them. While it is probable that penicillin levels could be further enhanced by increasing the sodium benzoate dosage, 3 patients complained of nausea with the dosage used.

Thus the oral administration of caronamide, together with large intramuscular doses of penicillin, makes it possible to maintain high penicillin levels with relative ease. The effect of caronamide in prolonging penicillin plasma levels is greater than that resulting from a 10 fold increase in the penicillin dosage.

DAVID H. LYNN, M.D.

Plasma Penicillin Levels After Oral Penicillin with and without Oral Caronamide. HARVEY SHIELDS COLLINS, ALBERT O. SEELER, and MAXWELL FINLAND. *Am. J. M. Sc.*, 1948, 216: 248

Studies on the effect of caronamide on the blood levels obtained during oral penicillin administration are the subject of this report. Male patients, both young and old, in whom no definite evidence of renal damage, congestive failure, or other serious illness was present, were selected. One tablet containing 100,000 units of crystalline potassium penicillin G,

buffered with 0.5 gm. sodium citrate, was given perorally every 4 hours, beginning at 9 a.m. on day 1, and continued through 5 p.m. of day 4. Blood samples were drawn before, during, and after the caronamide administration at such intervals as to provide several observations of the 4 hour level.

Caronamide tablets were also given orally, the first dose at 1 p.m. of day 2, with doses repeated every 4 hours at the same time as the penicillin, the final dose being given at 1 p.m. of day 3. Plasma penicillin levels between penicillin doses were obtained before the first and last doses of caronamide, and again 20 hours after the last dose of caronamide. The caronamide was employed in 3 different dosages: 8 patients under the age of 60 received 4 gm. every 4 hours; 9 patients over 60 were given 2 gm. every 4 hours; and 7 patients over 60 received 3 gm. every 4 hours. In the latter group, blood caronamide concentrations were determined.

Oral penicillin when administered alone in doses of 100,000 units every 4 hours could not be relied upon to maintain significant concentrations of the antibiotic in the plasma in persons under the age of 60. Penicillin levels of 0.03 units per ml. were maintained in more than two-thirds of persons over 60 years of age on the same dosage. Presumably this is due to a reduction in the functional tubular excretory mass in older people. This also accounts for the greater enhancing effect of caronamide in the aged.

Caronamide in oral doses of 4 gm. every 4 hours in persons under 60, and in doses of 3 gm. every 4 hours in those over 60 enhanced and prolonged the levels from oral penicillin. This effect, however, seemed to be less marked than that observed in patients who had been given penicillin intramuscularly. In the group in whom only 2 gm. of caronamide had been administered every 4 hours the results were quite irregular, and enhancement of penicillin levels throughout most of the caronamide period was noted in only 2 patients.

Determinations of plasma caronamide concentration indicate that absorption and/or excretion of orally administered caronamide varies in different individuals. This may account for the differences in the enhancing and prolonging effect of the caronamide, and for the duration of its effects.

In patients older than 60 years, with slightly elevated blood nonprotein nitrogen levels, the enhancing effect of caronamide persisted for at least 28 hours after the caronamide was discontinued. This effect was associated with persistence of significant caronamide concentrations in the blood of these patients. DAVID H. LYNN, M.D.

Discussion of Multiple Tumors (Considerazioni sui tumori multipli). L. BARBERA. *Tumori*, Milano, 1948, 34: 47.

The presence of two different benign tumors in the same individual or the occurrence of one benign and one malignant tumor is relatively frequent, contrary to a concurrent or successive development of two different malignant neoplasms. Three such cases are reported by the author.

A 57 year old woman had had her left breast removed at the age of 45. The diagnosis was adenocarcinoma. Twelve years later she developed an ovoid tumefaction of hard elastic consistency in the epigastric region. The roentgenologic examination disclosed the presence of an infiltrating and vegetating tumor on the lesser curvature of the stomach.

A 75 year old woman had been operated on at the age of 50 years for adenocarcinoma of the left breast. Five months prior to her admission to the hospital she developed meteorism and pain in the right lower quadrant of the abdomen. The autopsy revealed an adenocarcinoma of the right ovary with metastases in the spleen, omentum, and liver.

The third patient, a woman 64 years of age, had undergone an amputation of her right breast at the age of 52 years for a medullary carcinoma. Ten years later an adenocarcinoma of the left breast necessitated the removal of that organ.

In all 3 cases the family history disclosed the occurrence of malignant neoplasms in one or more members of the family. In the first case 12 years had elapsed between the first and the second tumors, in the second case the period was 25 years, and in the third case, 10 years. In all 3 instances the first tumor was located in the breast. All 3 women had had normal menstrual function and all were multiparas. JOSEPH K. NARAT, M.D.

Benign Giant-Cell Synovioma and Its Relation to "Xanthoma." M. J. STEWART. *J. Bone Surg.*, 1948, 30-B: 522.

The majority of benign synoviomas occur in the flexor tendons of the fingers and thumb, although some are of articular, bursal, or tenosynovial origin. Nearly three-quarters of the 40 cases of benign synoviomas observed in the routine surgical material from 1914 to 1947 at the General Infirmary, at Leeds, were from the fingers, in contrast to the occurrence of malignant synoviomas, which usually arise from the joints or bursae of the lower limbs (with less than 4 per cent from the fingers). The sex ratio for benign synoviomas is 1.3 male to 1 female. These tumors are rarely found in persons under 10 years of age or over 60 years of age.

Benign tumors of synovial origin are more properly called benign giant-cell synoviomas. Since there is no "xanthoma" cell, the term "xanthoma" is a misnomer. Cells of varied histogenesis, including histiocytes, fibrocytes, serosal, endothelial, and synovial cells, as well as neoplastic cells from the synovia (i.e., differentiated histiocytes) phagocytize lipoid and cholesterol esters derived from extravasated blood, disintegrating tissue, or secreting products to form the large lipoid-laden cells found in these tumors. FRANK B. QUEEN, M.D.

Clinical and Histological Considerations of Liposarcoma (Considerazione cliniche ed istogenetiche sul liposarcoma). ATTILIO BASILE. *Arch. ital. chir.*, 1948, 70: 183.

A rare case of liposarcoma with its various phases of malignant evolution is presented.

The 60 year old patient first noted a small tumor mass on the lower right chest wall, about as big as a nut, 6 years previously. This gradually increased in size until it reached the size of a fetal head but did not cause any symptoms. Three months before he was seen, however, the increase in size became more rapid and the tumor also became quite painful. When seen it had attained the size of a large melon. Clinical investigation, including roentgenograms of the chest and aspiration biopsy, were negative. A clinical diagnosis of liposarcoma was made and the mass excised under sodium pentothal anesthesia. The superficial part of the mass was divided into two parts by a deep sulcus but these parts were covered by the same capsule. On the under surface was found another mass, as large as an orange, penetrating into the deeper structure and adherent to the periosteum of the rib for an area of 2 by 4 cm., and also to the adjacent structures. It was also firmly adherent to the superficial mass.

The superficial portion was found to be a lipoma; however, the deeper portion was found to possess an incomplete capsule; it was of a reddish gray color, and rubbery in consistency. The microscopic picture was that of a liposarcoma.

From the study of this case and a review of the literature the author believes that the following considerations are correct:

Liposarcomas are rather rare and they may be encountered in any part of the body wherever there is adipose tissue. They are most frequently found subcutaneously or retroperitoneally.

Their morphology varies a great deal and, hence, the histologic interpretation and classification are difficult.

After evaluation of the microscopic reports and clinical course, many of the fibrolipomas, pseudolipomas, fibromixolipomas, and atypical lipomas reported in the literature will be considered true liposarcomas. LUCIAN J. FRONDUTI, M.D.

DUCTLESS GLANDS

Studies on the Stilbene Estrogens. Action on the Prostate (Ricerche sugli estrogeni stilbenici. Azione sulla prostata). P. LI VOTI and V. MUTOLO. *Tumori*, Milano, 1948, 34: 71.

Eight dogs were used in the authors' experiments because the prostate glands of the animals are the best developed of all animals used for experiments and are most responsive to the estrogens. Six of these dogs were treated for a month with daily intramuscular injections of 1 mgm. of diethyl dihydrostilbene per kilogram of body weight. Four of these were castrated one week before initiation of the injections. The 2 remaining animals were similarly treated but the injections were terminated after 15 days. These animals weighed from 4,500 to 5,500 gm. and were from 6 to 12 months of age. The dosages employed were considered equivalent to those employed in the human being in the treatment of cancer of the prostate gland.

Histologic examination of the prostate glands of these treated animals disclosed in every instance a proliferation of the prostatic stroma and a metaplasia of the epithelium of the prostatic urethra and of the periurethral glands. The glandular epithelium of the prostate, on the other hand, exhibited regressive changes. Here the normally present cubical or cylindrical, polystratified epithelium of the mucosal type was replaced by a monostratified, flat epithelium, apparently inactive as regards secretive function. There was no notable difference between the mode of response of the castrated animals from that of the noncastrated ones.

From their studies on this material the authors feel justified in postulating a direct action of the estrogenic preparation of an elective character on the prostatic tissues which suggests that this preparation is in the nature of a sexual hormone.

JOHN W. BRENNAN, M.D.